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Canadian Research Survey Data Conversions for Redfish in SA2 + Div. 3K based on Comparative Fishing Trials between an Engel 145 Otter Trawl and a Campelen 1800 Shrimp Trawl

Conversion de données sur le sébaste de la sous-zone 2 et de la division 3K issues de relevés de recherche canadiens reposant sur des essais de pêche comparée d'un chalut à panneaux Engel 145 et d'un chalut à crevettes Campelen 1800

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Abstract

In 1995, the Department of Fisheries and Oceans (DFO) Newfoundland Region replaced the research vessel, standard survey gear and fishing protocol that been utilized on groundfish surveys in Divs. 2J3K from 1977 to 1994. Comparative fishing trials were conducted in 1995 between the new vessel and gear (CCGS Teleost with Campelen 1800 shrimp trawl) the previous vessel and gear (MV Gadus Atlantica with Engel 145 Otter trawl). The data collected were analysed by length groups to provide a means to convert the older data time series into Campelen equivalents. The conversions did not distort any trends in the historic series for Div. 2J3K redfish but suggest that the rate of decline in the survey index since the 1970's was even greater. This is a reflection of the increased catchability of the Campelen for all size groups, particularly for those less than 30 cm.

Résumé

En 1995, la Région de Terre-Neuve du ministère des Pêches et des Océans (MPO) a remplacé le navire de recherche, l'engin de relevé normalisé et le protocole de pêche utilisés pour les relevés du poisson de fond dans les divisions 2J3K de 1977 à 1994. Des essais de pêche comparée des nouveaux navire et engin (NGCC Teleost armé d'un chalut à crevettes Campelen 1800) et des anciens navire et engin (NM Gadus Atlantica armé d'un chalut à panneaux Engel 145) ont été effectués en 1995. L'analyse des données recueillies selon les classes de longueur a permis de convertir les anciennes séries de données en équivalents Campelen. La conversion n'a pas faussé les tendances dans les séries historiques de données sur le sébaste des divisions 2J3K, mais donne à penser que le taux de diminution de l'indice de relevé depuis les années 1970 était beaucoup plus élevé, ce qui reflète le potentiel de capture accru de toutes les classes de longueur au chalut Campelen, en particulier les sébastes de moins de 30 cm de long.

Introduction

Multispecies comparative fishing trials were carried out in 1995 by the Department of Fisheries and Oceans (DFO) Newfoundland region for the purpose of deriving data conversion factors between an Engel 145 survey trawl and a *Campelen 1800* shrimp trawl. The Engel survey gear with bobbin footgear had been the standard survey gear for the Newfoundland region on the MV Gadus Atlantica from 1977-1994 primarily in Div 2J3K. The fishing trials were necessary to provide a means to maintain continuity with the older data time series.

There was also a change in vessel in the Div. 2J3K series with the change in survey gear to the Campelen 1800 with rockhopper footgear. Trials were conducted between the *CCGS* Teleost (new vessel, new survey gear) and the Gadus *Atlantica* (previous vessel, previous survey gear). Details of the fishing trials and a formulation of the experimental design and the length based data modelling are outlined in Warren (1996). Six target species were investigated (including redfish) because of their commercial significance and management requirements. A total of 285 successful parallel tows, spread over three trips, were accomplished in February-March 1995. For redfish, of the 250 trawl pairs in which fish were caught by one or both vessels, 8 pairs were determined to have been a situation where one vessel fished on an aggregation missed by the other vessel and were removed from the analysis.

The purpose of this paper is to illustrate the results of the conversion factors and the impact on length distribution as well as trends in stock size using the newly converted data time series. The method of applying the conversion factors was similar to Stansbury (1997).

Materials and Methods

For the applicable surveys in Div. 2J3K between 1978 and 1995, redfish length frequencies for each fishing set were first adjusted to a standardized for distance the net was towed and were then converted from Engel trawl catches to Campelen 1800 trawl catch equivalents. Conversion factors as presented in Warren (1996) for redfish were applied using weighted least squares as follows:

For the Gadus Atlantica conversion from Engel to Campelen Warren (1996):

The converted numbers at length $y_X = R_X * n_X$

where R = ratio of Campelen numbers caught to Engels number caught at length X (in 1 cm length classes)

n = number at length in the Engels fishing set

where

Model used: $\log R = 6.7580137 + 0.006839 * X - 1.927210 \log (X)$

Ratios for X<10 were fixed at X=10 because it was again considered that the model was estimating beyond the range of the data.

Weights were applied in the modeling as the number of fishing sets used to estimate the ratio for a given length class.

After the length frequencies were converted to a Campelen trawl catch equivalent with the model, a sampling ratio was applied if necessary to each length group and then summed to provide total numbers of redfish caught per standard Campelen set (0.8 nautical mile tow distance in 15 minutes with a wing spread of 16.84 m). These numbers were used to calculate a set weight using the following standard length-weight relationship:

$$WT\ (males) = 0.01659\ Forklength^{2.9548}$$
$$WT\ (females) = 0.013272\ Forklength^{3.0210}$$

This dataset was then used to generate mean number and weight (kg) per set by stratum and year for converted data. For comparative and information purposes the previous Engel data are presented here in Tables 1-4 (upper panels) for Div. 2J and Tables 5-8 (upper panels) for Div. 3K. The Campelen equivalent data are listed in the lower panels of the same tables. No adjustments have been made for differences due to revisions to the stratum areas based on updated hydrography charts (Bishop, MS 1994). These revisions were implemented on the 1993 survey.

Results and Discussion

In general the conversion factors derived for each comparative fishing trial reflect the increased catchability for smaller redfish (≤ 20 cm). For the Teleost/Gadus trials, the model estimated a ratio of fish caught by the Campelen to the Engel at about 1.0 for 38 cm fish and increased gradually to about 2 as the length approached 25 cm. This covers most of the range of fish lengths which comprise a good deal of the catches in various surveys in Div. 2J3K by the Gadus Atlantica. Ratios increased rapidly for fish length less than 25 cm, and the ratio at lengths less than 10 were fixed because there were few data for the smaller fish from the fishing trials.

For illustration, a comparison of indices of abundance and biomass between the converted and unconverted data sets in Div. 2J and Div. 3K is presented in Fig. 1. Overall trend in was the same except that the relative values estimated for the Campelen trawl are higher. This is also seen in a comparison of stratified mean number per tow at length for a few illustrative years in the surveys (Fig. 2). The catching efficiency of the Campelen for smaller fish (<20 cm) is demonstrated by these plots.

The Campelen equivalent conversions did not distort any trends in the historic series for Div. 2J3K redfish but suggest that the rate of decline from the late 1970's was even greater. This is a reflection of the increased catchability of the Campelen for all size groups, particularly for those less than 30 cm.

Adopting the Campelen has technically enabled a sampling tool that will detect recruitment to the stock at an earlier stage than before, not only for redfish but other species as well.

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Table 1. Mean number of redfish per standard tow in Division 2J from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets, 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	3.5 (2)	0.0 (2)	5.5 (2)	0.5 (6)	0.1 (11)	0.4 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.4 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	66.0 (3)	9.0 (2)	2.5 (2)	0.0 (3)	17.7 (6)	1.0 (2)	22.3 (4)	0.5 (4)	0.3 (3)	0.8 (4)	6.0 (3)	0.0 (4)	0.0 (3)	0.3 (7)	1.0 (7)
213	201-300	1725	236.7 (3)	249.3 (3)	1.0 (3)	10.2 (6)	12.1 (10)	320.1 (10)	150.8 (5)	1.9 (9)	0.0 (9)	1.2 (9)	1.1 (8)	0.0 (9)	0.5 (8)	0.3 (14)	0.2 (19)
214	201-300	1171	258.7 (3)	7.5 (2)	0.0 (2)	148.0 (5)	74.8 (8)	77.9 (8)	0.8 (4)	1.7 (6)	4.8 (6)	3.0 (6)	6.2 (6)	0.5 (6)	0.8 (5)	0.7 (15)	0.9 (14)
215	201-300	1270	24.0 (3)	13.5 (2)	27.5 (2)	2.8 (5)	3.0 (9)	5.3 (8)	5.3 (3)	1.2 (6)	5.5 (5)	0.4 (7)	0.4 (7)	0.7 (6)	1.3 (6)	0.3 (15)	1.3 (10)
228	201-300	1428	177.0 (3)	11.5 (2)	1029.5 (2)	4590.0 (6)	109.1 (10)	226.8 (6)	227.3 (7)	0.1 (7)	47.0 (6)	17.7 (7)	14.4 (5)	5.9 (8)	5.8 (6)	3.3 (3)	3.2 (5)
203	301-400	480	16.0 (2)	6.0 (2)	17.5 (2)	6.8 (2)	11.3 (3)	10.8 (3)	16.0 (2)	2.0 (3)	1.0 (2)	0.3 (3)	0.0 (2)	1.3 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	135.5 (2)	2059.0 (2)	29.5 (2)	14.5 (2)	18.7 (3)	11.5 (2)	52.7 (3)	32.7 (3)	0.5 (2)	2.5 (2)	1.5 (2)	3.5 (2)	0.0 (2)	1.0 (3)	2.3 (3)
211	301-400	330	44.5 (2)	40.5 (2)	66.0 (2)	993.3 (2)	46.0 (2)	0.5 (2)	109.5 (2)	154.7 (3)	1.5 (2)	9.5 (2)	2.0 (2)	11.0 (2)	2.5 (2)	1.4 (5)	1.3 (6)
216	301-400	384	4298.0 (2)	635.5 (2)	1745.5 (2)	187.0 (2)	479.5 (2)	360.0 (3)	539.0 (2)	197.0 (2)	667.4 (2)	399.5 (2)	123.0 (2)	44.0 (2)	7.0 (2)	9.3 (3)	7.3 (3)
222	301-400	441	3286.0 (2)	886.0 (2)	1120.5 (2)	2629.0 (2)	1848.0 (3)	2460.3 (3)	835.0 (3)	399.0 (2)	111.0 (2)	130.5 (2)	2383.0 (2)	21.0 (2)	7.0 (2)	2.0 (3)	8.0 (3)
229	301-400	567	175.0 (2)	408.0 (2)	659.0 (2)	1607.0 (2)	1262.5 (4)	1110.8 (4)	293.0 (3)	280.3 (3)	689.3 (3)	19.3 (3)	5.7 (3)	67.3 (3)	10.5 (2)	18.0 (3)	8.3 (3)
204	401-500	354	23.5 (2)	16.0 (2)	NS	16.5 (2)	1.7 (3)	15.7 (3)	23.5 (2)	0.0 (2)	0.5 (2)	0.0 (2)	0.5 (2)	1.5 (2)	6.5 (2)	1.7 (3)	1.0 (3)
217	401-500	268	1779.5 (2)	423.0 (2)	890.5 (2)	146.5 (2)	468.5 (2)	487.0 (2)	NS	152.5 (2)	407.5 (2)	203.5 (2)	560.5 (2)	46.5 (2)	124.0 (2)	21.3 (3)	82.2 (3)
223	401-500	180	2499.5 (2)	530.5 (2)	1113.0 (2)	877.0 (2)	652.0 (2)	510.5 (2)	573.0 (2)	574.0 (2)	950.0 (2)	149.0 (2)	733.0 (2)	75.0 (2)	29.5 (2)	26.3 (3)	24.5 (3)
227	401-500	686	1319.5 (2)	231.5 (2)	223.0 (2)	20.5 (2)	185.2 (5)	135.0 (4)	116.3 (3)	89.8 (4)	287.3 (3)	60.3 (4)	9.0 (3)	12.8 (4)	214.0 (3)	23.7 (6)	27.7 (6)
235	401-500	420	10.0 (2)	48.0 (2)	41.0 (2)	9.0 (2)	16.7 (3)	28.5 (2)	84.7 (3)	12.5 (2)	4.0 (2)	17.0 (2)	35.0 (2)	3.0 (2)	85.5 (2)	14.0 (3)	5.0 (3)
212	501-750	664	5.5 (2)	12.5 (2)	2.0 (2)	4.0 (2)	7.0 (5)	7.5 (3)	18.0 (3)	5.5 (4)	6.3 (3)	2.0 (4)	0.0 (2)	0.8 (4)	3.0 (3)	12.5 (2)	5.0 (2)
218	501-750	420	982.0 (2)	NS	520.0 (2)	156.5 (2)	87.5 (2)	168.5 (2)	NS	83.0 (2)	64.0 (2)	333.0 (2)	324.0 (2)	110.5 (2)	54.5 (2)	9.0 (2)	137.0 (2)
224	501-750	270	1176.0 (2)	720.0 (2)	498.5 (2)	342.5 (2)	151.0 (2)	169.5 (2)	220.5 (2)	37.5 (2)	214.4 (2)	205.5 (2)	442.0 (2)	21.0 (2)	14.5 (2)	26.5 (2)	29.5 (2)
230	501-750	237	2106.0 (2)	NS	262.8 (2)	126.5 (2)	210.0 (2)	116.0 (2)	125.5 (2)	113.0 (2)	470.0 (2)	221.5 (2)	54.5 (2)	118.5 (2)	274.5 (2)	72.0 (2)	47.5 (2)
219	751-1000	213	NS	NS	NS	14.3 (2)	NS	2.0 (2)	NS	0.0 (2)	22.0 (2)	0.5 (2)	2.5 (2)	0.0 (2)	6.2 (2)	0.0 (2)	1.0 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	4.5 (2)	5.0 (2)	32.5 (2)	23.5 (2)	9.5 (2)	2.0 (2)	8.0 (2)	NS	0.0 (2)	1.5 (2)	5.5 (2)
236	751-1000	122	NS	NS	NS	8.0 (2)	4.5 (2)	5.0 (2)	8.5 (2)	20.0 (2)	6.8 (2)	3.5 (2)	0.0 (2)	NS	0.5 (2)	0.0 (2)	2.5 (2)
Stratified Analysis:		Upper	675.1	1198.3	1248.7	1838.0	319.0	449.8	182.8	91.8	162.7	98.7	523.6	19.9	43.0	8.6	12.0
		Mean	492.5	213.9	295.7	667.0	175.8	226.9	127.6	53.1	100.0	43.7	116.9	13.8	23.4	6.3	10.3
		Lower	309.9	-770.5	-657.3	-503.8	32.6	4.0	72.0	14.4	37.2	-11.4	-289.9	7.6	3.9	4.0	8.9
Total Survey Abundance (millions)			556.24	316.2	388.7	724.0	199.4	249.4	131.8	59.4	104.8	48.8	128.4	14.8	25.8	6.9	11.2

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	38.5 (2)	0.0 (2)	10.5 (2)	0.7 (6)	1.0 (11)	0.9 (7)	0.1 (7)	0.1 (9)	0.0 (7)	2.5 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	598.7 (3)	19.5 (2)	5.0 (2)	0.0 (3)	73.7 (6)	1.5 (2)	153.0 (4)	3.3 (4)	0.7 (3)	0.0 (4)	41.3 (3)	0.0 (4)	0.0 (3)	1.0 (7)	4.0 (7)
213	201-300	1725	554.7 (3)	462.7 (3)	2.0 (3)	22.8 (6)	21.7 (10)	632.3 (10)	300.8 (5)	2.6 (9)	0.0 (9)	2.1 (9)	2.1 (8)	0.0 (9)	1.5 (8)	0.8 (14)	1.6 (19)
214	201-300	1171	522.3 (3)	11.0 (2)	0.0 (2)	257.6 (5)	134.0 (8)	126.8 (8)	1.3 (4)	2.8 (6)	9.3 (6)	4.8 (6)	15.5 (6)	1.0 (6)	1.6 (5)	1.8 (15)	2.7 (14)
215	201-300	1270	53.7 (3)	22.0 (2)	61.5 (2)	4.4 (5)	10.7 (9)	9.9 (8)	8.3 (3)	5.3 (6)	10.0 (5)	0.9 (7)	2.0 (7)	4.2 (6)	3.0 (6)	2.6 (15)	8.0 (10)
228	201-300	1428	688.7 (3)	33.5 (2)	1658.0 (2)	8259.2 (6)	219.0 (10)	362.2 (6)	376.1 (7)	0.7 (7)	97.2 (6)	31.0 (7)	23.0 (5)	13.3 (8)	20.0 (6)	20.3 (3)	17.2 (5)
203	301-400	480	70.5 (2)	19.0 (2)	40.0 (2)	22.5 (2)	32.3 (3)	26.7 (3)	39.5 (2)	7.0 (3)	1.5 (2)	1.0 (3)	0.0 (2)	4.7 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	270.0 (2)	2376.0 (2)	42.5 (2)	30.5 (2)	43.7 (3)	29.0 (2)	88.7 (3)	67.3 (3)	1.0 (2)	6.5 (2)	1.5 (2)	8.5 (2)	0.0 (2)	2.7 (3)	6.7 (3)
211	301-400	330	101.0 (2)	71.0 (2)	92.5 (2)	1113.0 (2)	86.0 (2)	1.0 (2)	193.0 (2)	251.7 (3)	2.5 (2)	17.0 (2)	2.5 (2)	36.5 (2)	6.0 (2)	6.2 (5)	5.2 (6)
216	301-400	384	6744.0 (2)	1000.0 (2)	2580.0 (2)	306.0 (2)	741.5 (2)	613.0 (3)	820.5 (2)	331.5 (2)	1132.0 (2)	665.0 (2)	209.5 (2)	108.5 (2)	13.5 (2)	20.7 (3)	17.0 (3)
222	301-400	441	5265.5 (2)	1536.5 (2)	1898.0 (2)	4246.5 (2)	3382.7 (3)	3948.7 (3)	1440.7 (3)	657.5 (2)	177.5 (2)	194.5 (2)	3468.0 (2)	49.0 (2)	14.0 (2)	12.3 (3)	21.0 (3)
229	301-400	567	384.0 (2)	636.5 (2)	1052.5 (2)	2459.0 (2)	2263.3 (4)	2021.3 (4)	436.0 (3)	508.0 (3)	1072.0 (3)	38.0 (3)	8.7 (3)	134.3 (3)	30.5 (2)	90.3 (3)	26.0 (3)
204	401-500	354	94.0 (2)	50.0 (2)	NS	49.5 (2)	4.3 (3)	39.3 (3)	56.5 (2)	0.0 (2)	1.0 (2)	0.0 (2)	0.5 (2)	2.5 (2)	13.0 (2)	4.7 (3)	3.3 (3)
217	401-500	268	2762.5 (2)	714.0 (2)	1229.0 (2)	210.0 (2)	703.5 (2)	688.5 (2)	NS	228.5 (2)	626.0 (2)	302.0 (2)	787.5 (2)	71.0 (2)	320.5 (2)	50.7 (3)	208.7 (3)
223	401-500	180	3810.0 (2)	865.5 (2)	1556.0 (2)	1220.0 (2)	879.0 (2)	686.0 (2)	858.0 (2)	753.0 (2)	1182.5 (2)	207.0 (2)	942.5 (2)	133.0 (2)	68.5 (2)	62.7 (3)	61.0 (3)
227	401-500	686	1476.0 (2)	306.0 (2)	290.5 (2)	34.5 (2)	258.4 (5)	189.5 (4)	161.7 (3)	127.3 (4)	355.3 (3)	84.0 (4)	10.7 (3)	21.8 (4)	311.7 (3)	62.7 (6)	74.3 (6)
235	401-500	420	21.5 (2)	93.5 (2)	58.0 (2)	15.5 (2)	30.0 (3)	49.5 (2)	138.3 (3)	20.5 (2)	8.5 (2)	27.0 (2)	63.5 (2)	4.5 (2)	114.5 (2)	36.7 (3)	13.0 (3)
212	501-750	664	8.0 (2)	20.0 (2)	5.0 (2)	6.0 (2)	11.6 (5)	12.7 (3)	27.3 (3)	9.0 (4)	10.7 (3)	5.5 (4)	0.0 (2)	1.5 (4)	8.5 (3)	21.3 (2)	12.0 (2)
218	501-750	420	1205.5 (2)	NS	634.0 (2)	200.5 (2)	109.5 (2)	211.0 (2)	NS	118.0 (2)	76.5 (2)	435.5 (2)	383.0 (2)	155.5 (2)	83.5 (2)	15.0 (2)	307.0 (2)
224	501-750	270	1367.0 (2)	995.5 (2)	644.0 (2)	432.0 (2)	187.5 (2)	216.0 (2)	307.0 (2)	43.5 (2)	250.0 (2)	252.5 (2)	514.0 (2)	29.0 (2)	25.3 (2)	43.5 (2)	55.5 (2)
230	501-750	237	2833.5 (2)	NS	311.5 (2)	159.5 (2)	263.0 (2)	149.0 (2)	181.0 (2)	140.0 (2)	550.0 (2)	260.5 (2)	58.0 (2)	149.5 (2)	410.5 (2)	151.5 (2)	85.0 (2)
219	751-1000	213	NS	NS	NS	19.0 (2)	NS	2.0 (2)	NS	0.0 (2)	26.5 (2)	1.0 (2)	3.0 (2)	0.0 (2)	12.6 (2)	2.2 (2)	1.0 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	5.5 (2)	7.0 (2)	43.5 (2)	35.0 (2)	10.0 (2)	2.0 (2)	9.5 (2)	NS	0.0 (2)	2.0 (2)	12.5 (2)
236	751-1000	122	NS	NS	NS	12.5 (2)	6.0 (2)	6.0 (2)	10.5 (2)	25.0 (2)	7.5 (2)	3.5 (2)	0.0 (2)	NS	0.5 (2)	0.0 (2)	3.0 (2)
Stratified Analysis		Upper	1118.0	766.5	2005.9	3245.3	563.6	709.4	317.7	157.1	289.1	148.2	744.2	37.2	63.9	23.3	30.5
		Mean	830.5	320.6	452.5	1140.4	305.6	381.5	218.5	84.9	147.5	63.9	166.4	24.6	39.5	17.4	25.8
		Lower	543.0	-125.3	-1100.8	-964.5	47.5	53.6	119.3	12.6	5.8	-20.5	-411.4	12.1	15.2	11.5	21.1
Converted Survey Abund(millions)			1719.8	883.8	888.8	2268.4	606.5	788.4	413.1	176.9	297.1	128.8	334.1	48.8	78.7	34.4	51.6

2J Autumn 1978-1992 Mean Number per tow

Table 1 Mean number of redfish per standard tow in Division 2J from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost 15 min tow @ 3.0 knots). Number of successful sets in brackets. 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	3.5 (2)	0.0 (2)	5.5 (2)	0.5 (6)	0.1 (11)	0.4 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.4 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	66.0 (3)	9.0 (2)	2.5 (2)	0.0 (3)	17.7 (6)	1.0 (2)	22.3 (4)	0.5 (4)	0.3 (3)	0.8 (4)	6.0 (3)	0.0 (4)	0.0 (3)	0.3 (7)	1.0 (7)
213	201-300	1725	236.7 (3)	249.3 (3)	1.0 (3)	10.2 (6)	12.1 (10)	320.1 (10)	150.8 (5)	1.9 (9)	0.0 (9)	1.2 (9)	1.1 (8)	0.0 (9)	0.5 (8)	0.3 (14)	0.2 (19)
214	201-300	1171	258.7 (3)	7.5 (2)	0.0 (2)	148.0 (5)	74.8 (8)	77.9 (8)	0.8 (4)	1.7 (6)	4.8 (6)	3.0 (6)	6.2 (6)	0.5 (6)	0.8 (5)	0.7 (15)	0.9 (14)
215	201-300	1270	24.0 (3)	13.5 (2)	27.5 (2)	2.8 (5)	3.0 (9)	5.3 (8)	5.3 (3)	1.2 (6)	5.5 (5)	0.4 (7)	0.4 (7)	0.7 (6)	1.3 (6)	0.3 (15)	1.3 (10)
228	201-300	1428	177.0 (3)	11.5 (2)	1029.5 (2)	4590.0 (6)	109.1 (10)	226.8 (6)	227.3 (7)	0.1 (7)	47.0 (6)	17.7 (7)	14.4 (5)	5.9 (8)	5.8 (6)	3.3 (3)	3.2 (5)
203	301-400	480	16.0 (2)	6.0 (2)	17.5 (2)	6.8 (2)	11.3 (3)	10.8 (3)	16.0 (2)	2.0 (3)	1.0 (2)	0.3 (3)	0.0 (2)	1.3 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	135.5 (2)	2059.0 (2)	29.5 (2)	14.5 (2)	18.7 (3)	11.5 (2)	52.7 (3)	32.7 (3)	0.5 (2)	2.5 (2)	1.5 (2)	3.5 (2)	0.0 (2)	1.0 (3)	2.3 (3)
211	301-400	330	44.5 (2)	40.5 (2)	66.0 (2)	993.3 (2)	46.0 (2)	0.5 (2)	109.5 (2)	154.7 (3)	1.5 (2)	9.5 (2)	2.0 (2)	11.0 (2)	2.5 (2)	1.4 (5)	1.3 (6)
216	301-400	384	4298.0 (2)	635.5 (2)	1745.5 (2)	187.0 (2)	479.5 (2)	360.0 (3)	539.0 (2)	197.0 (2)	667.4 (2)	399.5 (2)	123.0 (2)	44.0 (2)	7.0 (2)	9.3 (3)	7.3 (3)
222	301-400	441	3286.0 (2)	886.0 (2)	1120.5 (2)	2629.0 (2)	1848.0 (3)	2460.3 (3)	835.0 (3)	399.0 (2)	111.0 (2)	130.5 (2)	2383.0 (2)	21.0 (2)	7.0 (2)	2.0 (3)	8.0 (3)
229	301-400	567	175.0 (2)	408.0 (2)	659.0 (2)	1607.0 (2)	1262.5 (4)	1110.8 (4)	293.0 (3)	280.3 (3)	689.3 (3)	19.3 (3)	5.7 (3)	67.3 (3)	10.5 (2)	18.0 (3)	8.3 (3)
204	401-500	354	23.5 (2)	16.0 (2)	NS	16.5 (2)	1.7 (3)	15.7 (3)	23.5 (2)	0.0 (2)	0.5 (2)	0.0 (2)	0.5 (2)	1.5 (2)	6.5 (2)	1.7 (3)	1.0 (3)
217	401-500	268	1779.5 (2)	423.0 (2)	890.5 (2)	146.5 (2)	468.5 (2)	487.0 (2)	NS	152.5 (2)	407.5 (2)	203.5 (2)	560.5 (2)	46.5 (2)	124.0 (2)	21.3 (3)	82.2 (3)
223	401-500	180	2499.5 (2)	530.5 (2)	1113.0 (2)	877.0 (2)	652.0 (2)	510.5 (2)	573.0 (2)	574.0 (2)	950.0 (2)	149.0 (2)	733.0 (2)	75.0 (2)	29.5 (2)	26.3 (3)	24.5 (3)
227	401-500	686	1319.5 (2)	231.5 (2)	223.0 (2)	20.5 (2)	185.2 (5)	135.0 (4)	116.3 (3)	89.8 (4)	287.3 (3)	60.3 (4)	9.0 (3)	12.8 (4)	214.0 (3)	23.7 (6)	27.7 (6)
235	401-500	420	10.0 (2)	48.0 (2)	41.0 (2)	9.0 (2)	16.7 (3)	28.5 (2)	84.7 (3)	12.5 (2)	4.0 (2)	17.0 (2)	35.0 (2)	3.0 (2)	85.5 (2)	14.0 (3)	5.0 (3)
212	501-750	664	5.5 (2)	12.5 (2)	2.0 (2)	4.0 (2)	7.0 (5)	7.5 (3)	18.0 (3)	5.5 (4)	6.3 (3)	2.0 (4)	0.0 (2)	0.8 (4)	3.0 (3)	12.5 (2)	5.0 (2)
218	501-750	420	982.0 (2)	NS	520.0 (2)	156.5 (2)	87.5 (2)	168.5 (2)	NS	83.0 (2)	64.0 (2)	333.0 (2)	324.0 (2)	110.5 (2)	54.5 (2)	9.0 (2)	137.0 (2)
224	501-750	270	1176.0 (2)	720.0 (2)	498.5 (2)	342.5 (2)	151.0 (2)	169.5 (2)	220.5 (2)	37.5 (2)	214.4 (2)	205.5 (2)	442.0 (2)	21.0 (2)	14.5 (2)	26.5 (2)	29.5 (2)
230	501-750	237	2106.0 (2)	NS	262.8 (2)	126.5 (2)	210.0 (2)	116.0 (2)	125.5 (2)	113.0 (2)	470.0 (2)	221.5 (2)	54.5 (2)	118.5 (2)	274.5 (2)	72.0 (2)	47.5 (2)
219	751-1000	213	NS	NS	NS	14.3 (2)	NS	2.0 (2)	NS	0.0 (2)	22.0 (2)	0.5 (2)	2.5 (2)	0.0 (2)	6.2 (2)	0.0 (2)	1.0 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	4.5 (2)	5.0 (2)	32.5 (2)	23.5 (2)	9.5 (2)	2.0 (2)	8.0 (2)	NS	0.0 (2)	1.5 (2)	5.5 (2)
236	751-1000	122	NS	NS	NS	8.0 (2)	4.5 (2)	5.0 (2)	8.5 (2)	20.0 (2)	6.8 (2)	3.5 (2)	0.0 (2)	NS	0.5 (2)	0.0 (2)	2.5 (2)
Stratified Analysis		Upper	675.1	1198.3	1248.7	1838.0	319.0	449.8	182.8	91.8	162.7	98.7	523.6	19.9	43.0	8.6	12.0
		Mean	492.5	213.9	295.7	667.0	175.8	226.9	127.6	53.1	100.0	43.7	116.9	13.8	23.4	6.3	10.3
		Lower	309.9	-770.5	-657.3	-503.9	32.6	4.0	72.0	14.4	37.2	-11.4	-289.9	7.6	3.9	4.0	8.9
Total Survey Abundance (millions)			**556.24**	**216.2**	**309.7**	**724.0**	**190.4**	**249.4**	**131.6**	**58.4**	**109.9**	**48.0**	**128.4**	**14.8**	**25.8**	**6.9**	**11.3**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	38.5 (2)	0.0 (2)	10.5 (2)	0.7 (6)	1.0 (11)	0.9 (7)	0.1 (7)	0.1 (9)	0.0 (7)	2.5 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	598.7 (3)	19.5 (2)	5.0 (2)	0.0 (3)	73.7 (6)	1.5 (2)	153.0 (4)	3.3 (4)	0.7 (3)	0.0 (4)	41.3 (3)	0.0 (4)	0.0 (3)	1.0 (7)	4.0 (7)
213	201-300	1725	554.7 (3)	462.7 (3)	2.0 (3)	22.8 (6)	21.7 (10)	632.3 (10)	300.6 (5)	2.6 (9)	0.0 (9)	2.1 (9)	2.1 (8)	0.0 (9)	1.5 (8)	0.8 (14)	1.6 (19)
214	201-300	1171	522.3 (3)	11.0 (2)	0.0 (2)	257.6 (5)	134.0 (8)	126.8 (8)	1.3 (4)	2.8 (6)	9.3 (6)	4.8 (6)	15.5 (6)	1.0 (6)	1.6 (5)	1.8 (15)	2.7 (14)
215	201-300	1270	53.7 (3)	22.0 (2)	61.5 (2)	4.4 (5)	10.7 (9)	9.9 (8)	8.3 (3)	5.3 (6)	10.0 (5)	0.9 (7)	2.0 (7)	4.2 (6)	3.0 (6)	2.6 (15)	8.0 (10)
228	201-300	1428	688.7 (3)	33.5 (2)	1658.0 (2)	8259.2 (6)	219.0 (10)	362.2 (6)	376.1 (7)	0.7 (7)	97.2 (6)	31.0 (7)	23.0 (5)	13.3 (8)	20.0 (6)	20.3 (3)	17.2 (5)
203	301-400	480	70.5 (2)	19.0 (2)	40.0 (2)	22.5 (2)	32.3 (3)	26.7 (3)	39.5 (2)	7.0 (3)	1.5 (2)	1.0 (3)	0.0 (2)	4.7 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	270.0 (2)	2376.0 (2)	42.5 (2)	30.5 (2)	43.7 (3)	29.0 (2)	88.7 (3)	67.3 (3)	1.0 (2)	6.5 (2)	1.5 (2)	8.5 (2)	0.0 (2)	2.7 (3)	6.7 (3)
211	301-400	330	101.0 (2)	71.0 (2)	92.5 (2)	1113.0 (2)	86.0 (2)	1.0 (2)	193.0 (2)	251.7 (3)	2.5 (2)	17.0 (2)	2.5 (2)	36.5 (2)	6.0 (2)	6.2 (5)	5.2 (6)
216	301-400	384	6744.0 (2)	1000.0 (2)	2580.0 (2)	306.0 (2)	741.5 (2)	613.0 (3)	820.5 (2)	331.5 (2)	1132.0 (2)	665.0 (2)	209.5 (2)	108.5 (2)	13.5 (2)	20.7 (3)	17.0 (3)
222	301-400	441	5265.5 (2)	1536.5 (2)	1898.0 (2)	4246.5 (2)	3382.7 (3)	3948.7 (3)	1440.7 (3)	657.5 (2)	177.5 (2)	194.5 (2)	3468.0 (2)	49.0 (2)	14.0 (2)	12.3 (3)	21.0 (3)
229	301-400	567	384.0 (2)	636.5 (2)	1052.5 (2)	2459.0 (2)	2263.3 (4)	2021.3 (4)	436.0 (3)	508.0 (3)	1072.0 (3)	38.0 (3)	8.7 (3)	134.3 (3)	30.5 (2)	90.3 (3)	26.0 (3)
204	401-500	354	94.0 (2)	50.0 (2)	NS	49.5 (2)	4.3 (3)	39.3 (3)	56.5 (2)	0.0 (2)	1.0 (2)	0.0 (2)	0.5 (2)	2.5 (2)	13.0 (2)	4.7 (3)	3.3 (3)
217	401-500	268	2762.5 (2)	714.0 (2)	1229.0 (2)	210.0 (2)	703.5 (2)	688.5 (2)	NS	228.5 (2)	626.0 (2)	302.0 (2)	787.5 (2)	71.0 (2)	320.5 (2)	50.7 (3)	208.7 (3)
223	401-500	180	3810.0 (2)	865.5 (2)	1556.0 (2)	1220.0 (2)	979.0 (2)	686.0 (2)	858.0 (2)	753.0 (2)	1182.5 (2)	207.0 (2)	942.5 (2)	133.0 (2)	58.5 (2)	62.7 (3)	61.0 (3)
227	401-500	686	1476.0 (2)	306.0 (2)	290.5 (2)	34.5 (2)	258.4 (5)	189.5 (4)	161.7 (3)	127.3 (4)	355.3 (3)	84.0 (4)	10.7 (3)	21.8 (4)	311.7 (3)	62.7 (6)	74.3 (6)
235	401-500	420	21.5 (2)	93.5 (2)	58.0 (2)	15.5 (2)	30.0 (3)	49.5 (2)	138.3 (3)	20.5 (2)	8.5 (2)	27.0 (2)	63.5 (2)	4.5 (2)	114.5 (2)	33.7 (3)	13.0 (3)
212	501-750	664	8.0 (2)	20.0 (2)	5.0 (2)	6.0 (2)	11.6 (5)	12.7 (3)	27.3 (3)	9.0 (4)	10.7 (3)	5.5 (4)	0.0 (2)	1.5 (4)	8.3 (3)	21.0 (2)	12.0 (2)
218	501-750	420	1205.5 (2)	NS	634.0 (2)	200.5 (2)	109.5 (2)	211.0 (2)	NS	118.0 (2)	76.5 (2)	435.5 (2)	383.0 (2)	155.5 (2)	83.5 (2)	15.5 (2)	307.0 (2)
224	501-750	270	1367.0 (2)	995.5 (2)	644.0 (2)	432.0 (2)	187.5 (2)	216.0 (2)	307.0 (2)	43.5 (2)	250.0 (2)	252.5 (2)	514.0 (2)	29.0 (2)	23.5 (2)	54.5 (2)	55.5 (2)
230	501-750	237	2933.5 (2)	NS	311.5 (2)	159.5 (2)	263.0 (2)	149.0 (2)	181.0 (2)	140.0 (2)	550.0 (2)	260.5 (2)	58.0 (2)	149.5 (2)	410.5 (2)	130.5 (2)	85.0 (2)
219	751-1000	213	NS	NS	NS	19.0 (2)	NS	2.0 (2)	NS	0.0 (2)	26.5 (2)	1.0 (2)	3.0 (2)	0.0 (2)	12.0 (2)	0.0 (2)	1.0 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	5.6 (2)	7.0 (2)	43.5 (2)	35.0 (2)	10.0 (2)	2.0 (2)	9.5 (2)	NS	0.0 (2)	2.0 (2)	12.5 (2)
236	751-1000	122	NS	NS	NS	12.5 (2)	6.0 (2)	6.0 (2)	10.5 (2)	26.0 (2)	7.5 (2)	3.5 (2)	0.0 (2)	NS	0.5 (2)	0.0 (2)	3.0 (2)
Stratified Analysis		Upper	1118.0	766.5	2005.9	3245.3	563.6	709.4	317.7	157.1	289.1	148.2	744.2	37.2	63.9	23.3	30.5
		Mean	830.5	320.6	452.5	1140.4	305.6	381.5	218.5	84.9	147.5	63.9	166.4	24.6	39.5	17.4	25.8
		Lower	543.0	125.3	1100.8	964.5	47.5	53.6	119.3	12.6	5.8	-20.5	411.4	12.1	15.2	11.5	21.1
Converted Survey Abundance (millions)			**1719.0**	**593.9**	**868.0**	**2268.4**	**606.5**	**768.4**	**413.1**	**170.9**	**297.1**	**128.6**	**335.1**	**48.6**	**79.7**	**35.0**	**52.0**

2J Autumn 1978-1992 Mean Number per tow

Table 2 Mean number of redfish per standard tow in Division 2J from 1993-1994. Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets. NS = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi.) 1978-1992	Area (sq n mi.) 1993-Onwards	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.3 (6)	0.3 (3)
214	201-300	1171	1341	0.0 (5)	0.2 (6)
215	201-300	1270	1302	1.0 (5)	0.2 (5)
228	201-300	1428	2196	0.3 (9)	0.7 (3)
203	301-400	480	487	1.0 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	4.0 (2)	1.5 (2)
222	301-400	441	450	1.5 (2)	3.3 (3)
229	301-400	567	536	7.0 (2)	0.3 (3)
204	401-500	354	288	0.5 (2)	4.3 (3)
217	401-500	268	241	28.5 (2)	29.7 (3)
223	401-500	180	158	22.6 (2)	3.0 (3)
227	401-500	686	598	12.8 (3)	3.8 (5)
235	401-500	420	414	4.0 (3)	10.7 (3)
212	501-750	664	557	5.0 (2)	2.0 (3)
218	501-750	420	362	25.0 (2)	34.0 (2)
224	501-750	270	228	77.0 (2)	49.3 (3)
230	501-750	237	185	9.0 (2)	74.0 (3)
219	751-1000	213	283	10.5 (2)	0.5 (2)
231	751-1000	182	186	2.5 (2)	2.7 (3)
236	751-1000	122	193	5.0 (2)	0.7 (3)
	Stratified Analysis		Upper	18.6	11.7
			Mean	4.4	4.1
			Lower	-9.7	-3.4
	Total Survey Abundance (millions)			**4.905**	**4.6**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi.)	Area (sq n mi.)	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.5 (6)	0.3 (3)
214	201-300	1171	1341	0.0 (5)	0.3 (6)
215	201-300	1270	1302	3.8 (5)	1.2 (5)
228	201-300	1428	2196	2.1 (9)	4.3 (3)
203	301-400	480	487	3.0 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	10.5 (2)	6.0 (2)
222	301-400	441	450	4.5 (2)	8.0 (3)
229	301-400	567	536	21.0 (2)	3.7 (3)
204	401-500	354	288	1.5 (2)	14.3 (3)
217	401-500	268	241	70.0 (2)	67.7 (3)
223	401-500	180	158	52.5 (2)	5.7 (3)
227	401-500	686	598	26.7 (3)	8.4 (5)
235	401-500	420	414	9.0 (3)	26.3 (3)
212	501-750	664	557	12.0 (2)	5.0 (3)
218	501-750	420	362	48.0 (2)	65.0 (2)
224	501-750	270	228	162.5 (2)	100.3 (3)
230	501-750	237	185	17.0 (2)	140.3 (3)
219	751-1000	213	283	17.0 (2)	0.5 (2)
231	751-1000	182	186	3.5 (2)	3.7 (3)
236	751-1000	122	193	8.0 (2)	1.0 (3)
	Stratified Analysis		Upper	40.3	14.6
			Mean	10.0	9.3
			Lower	-20.2	3.9
	Converted Survey Abundance (millions)			**20.4**	**18.8**

2J Autumn 1993-1994 Mean Number per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey. For further information see Bishop (1994), Murphy (1996))

Table 3 Mean weight (kg) of redfish per standard tow in Division 2J from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets. 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	0.1 (2)	0.0 (2)	3.7 (2)	0.5 (6)	0.0 (11)	0.1 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.0 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	1.5 (3)	3.2 (2)	1.0 (2)	0.0 (3)	2.9 (6)	0.8 (2)	2.0 (4)	0.0 (4)	0.1 (3)	0.2 (4)	0.5 (3)	0.0 (4)	0.0 (3)	0.1 (7)	0.2 (7)
213	201-300	1725	55.0 (3)	85.9 (3)	0.4 (3)	2.8 (6)	4.6 (10)	92.8 (10)	42.3 (5)	1.0 (9)	0.0 (9)	0.5 (9)	0.4 (8)	0.0 (9)	0.1 (8)	0.1 (14)	0.0 (19)
214	201-300	1171	75.2 (3)	4.5 (2)	0.0 (2)	54.1 (5)	28.2 (8)	32.0 (8)	0.4 (4)	0.7 (6)	1.6 (6)	1.6 (6)	2.7 (6)	0.2 (6)	0.2 (5)	0.1 (15)	0.2 (14)
215	201-300	1270	9.6 (3)	6.0 (2)	7.5 (2)	1.2 (5)	0.4 (9)	1.7 (8)	2.3 (3)	0.2 (6)	1.4 (5)	0.3 (7)	0.1 (7)	0.1 (6)	0.2 (6)	0.1 (15)	0.2 (10)
228	201-300	1428	28.0 (3)	3.3 (2)	437.5 (2)	1548.5 (6)	31.6 (10)	103.5 (6)	88.4 (7)	0.0 (7)	17.9 (6)	6.6 (7)	5.8 (5)	1.6 (8)	1.1 (6)	0.7 (3)	0.2 (5)
203	301-400	480	1.3 (2)	0.7 (2)	3.3 (2)	0.8 (2)	2.4 (3)	1.5 (3)	3.8 (2)	0.1 (3)	0.3 (2)	0.0 (3)	0.0 (2)	0.5 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	42.4 (2)	1540.4 (2)	17.8 (2)	26.0 (2)	7.2 (3)	2.9 (2)	20.0 (3)	11.5 (3)	0.2 (2)	0.6 (2)	1.2 (2)	1.7 (2)	0.0 (2)	0.1 (3)	0.7 (3)
211	301-400	330	18.8 (2)	19.3 (2)	46.0 (2)	987.0 (2)	13.8 (2)	0.1 (2)	38.3 (2)	64.8 (3)	0.9 (2)	3.5 (2)	1.1 (2)	2.4 (2)	0.7 (2)	0.4 (5)	0.3 (6)
216	301-400	384	2209.5 (2)	267.7 (2)	590.2 (2)	69.5 (2)	195.8 (2)	133.7 (3)	272.5 (2)	70.6 (2)	227.1 (2)	141.5 (2)	50.0 (2)	8.4 (2)	3.1 (2)	2.5 (3)	1.7 (3)
222	301-400	441	1331.5 (2)	303.0 (2)	402.5 (2)	1033.8 (2)	582.0 (3)	963.5 (3)	303.3 (3)	152.5 (2)	47.1 (2)	63.0 (2)	1064.3 (2)	6.2 (2)	1.9 (2)	0.4 (3)	1.8 (3)
229	301-400	567	69.6 (2)	181.4 (2)	285.3 (2)	769.3 (2)	432.9 (4)	364.1 (4)	131.8 (3)	50.2 (3)	321.5 (3)	6.7 (3)	2.1 (3)	26.1 (3)	3.3 (2)	1.5 (3)	1.5 (3)
204	401-500	354	5.7 (2)	7.0 (2)	NS	3.4 (2)	0.4 (3)	2.6 (3)	5.0 (2)	0.0 (2)	0.2 (2)	0.8 (2)	0.3 (2)	0.6 (2)	2.2 (2)	0.6 (3)	0.1 (3)
217	401-500	268	704.9 (2)	164.3 (2)	470.6 (2)	73.8 (2)	214.0 (2)	239.8 (2)	NS	73.5 (2)	181.6 (2)	92.5 (2)	272.8 (2)	20.2 (2)	22.6 (2)	4.9 (3)	13.8 (3)
223	401-500	180	1131.3 (2)	221.9 (2)	538.5 (2)	459.2 (2)	358.2 (2)	271.0 (2)	247.0 (2)	328.8 (2)	606.8 (2)	76.3 (2)	449.3 (2)	28.7 (2)	7.4 (2)	6.6 (3)	4.8 (3)
227	401-500	686	714.0 (2)	148.5 (2)	159.3 (2)	8.0 (2)	99.9 (5)	70.9 (4)	57.3 (3)	45.5 (4)	199.2 (3)	38.9 (4)	5.0 (3)	5.2 (4)	105.5 (3)	5.0 (6)	5.6 (6)
235	401-500	420	3.0 (2)	17.0 (2)	23.5 (2)	4.3 (2)	6.2 (3)	13.3 (2)	38.0 (3)	5.0 (2)	1.0 (2)	8.5 (2)	15.3 (2)	1.4 (2)	52.4 (2)	4.5 (3)	1.1 (3)
212	501-750	664	3.4 (2)	4.8 (2)	0.6 (2)	2.8 (2)	3.4 (5)	2.7 (3)	9.0 (3)	1.6 (4)	2.6 (3)	0.8 (4)	0.0 (2)	0.2 (4)	0.7 (3)	4.8 (2)	1.1 (2)
218	501-750	420	611.7 (2)	NS	314.5 (2)	92.0 (2)	55.5 (2)	99.3 (2)	NS	41.3 (2)	44.3 (2)	194.0 (2)	245.8 (2)	54.0 (2)	24.8 (2)	3.4 (2)	27.3 (2)
224	501-750	270	836.9 (2)	425.0 (2)	293.3 (2)	204.8 (2)	99.0 (2)	110.8 (2)	114.5 (2)	26.3 (2)	151.4 (2)	138.0 (2)	326.3 (2)	9.8 (2)	5.6 (2)	7.0 (2)	9.6 (2)
230	501-750	237	1160.5 (2)	NS	196.5 (2)	79.8 (2)	134.2 (2)	74.5 (2)	63.3 (2)	72.0 (2)	326.5 (2)	151.0 (2)	50.3 (2)	80.3 (2)	141.0 (2)	25.2 (2)	15.0 (2)
219	751-1000	213	NS	NS	NS	8.0 (2)	NS	1.9 (2)	NS	0.0 (2)	(2)	0.2 (2)	1.5 (2)	0.0 (2)	2.6 (2)	0.0 (2)	0.7 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	3.5 (2)	2.3 (2)	17.8 (2)	9.8 (2)	6.2 (2)	1.6 (2)	5.3 (2)	NS	0.0 (2)	0.7 (2)	2.1 (2)
236	751-1000	122	NS	NS	NS	3.8 (2)	2.8 (2)	3.0 (2)	4.8 (2)	12.5 (2)	6.3 (2)	2.4 (2)	0.0 (2)	NS	0.4 (2)	0.0 (2)	1.6 (2)
Stratified Analysis		Upper	370.0	779.7	468.9	659.6	114.7	172.8	71.6	43.2	81.9	40.8	249.0	9.8	20.9	2.2	2.5
		Mean	224.8	112.7	131.4	260.4	66.1	88.3	50.8	21.2	51.8	22.2	59.5	5.9	10.6	1.6	2.2
		Lower	79.6	-554.3	-206.1	-138.7	17.4	3.8	30.0	-0.8	-21.7	3.5	-129.9	1.9	0.4	1.1	1.8
Total Survey Biomass ('000 tons)			**253.95**	**113.9**	**137.6**	**282.7**	**71.5**	**97.1**	**52.4**	**23.3**	**57.0**	**24.4**	**65.4**	**6.3**	**11.7**	**1.8**	**2.4**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	0.4 (2)	0.0 (2)	3.6 (2)	0.4 (6)	0.0 (11)	0.2 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.1 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	10.6 (3)	4.4 (2)	1.8 (2)	0.0 (3)	5.7 (6)	0.7 (2)	6.0 (4)	0.1 (4)	0.2 (3)	0.0 (4)	1.4 (3)	0.0 (4)	0.0 (3)	0.1 (7)	0.4 (7)
213	201-300	1725	107.8 (3)	129.7 (3)	0.6 (3)	4.7 (6)	6.5 (10)	158.3 (10)	73.7 (5)	1.1 (9)	0.0 (9)	0.8 (9)	0.6 (8)	0.0 (9)	0.2 (8)	0.2 (14)	0.0 (19)
214	201-300	1171	131.8 (3)	4.6 (2)	0.0 (2)	79.6 (5)	41.0 (8)	45.3 (8)	0.5 (4)	1.0 (6)	2.4 (6)	1.8 (6)	3.3 (6)	0.3 (6)	0.4 (5)	0.3 (15)	0.4 (14)
215	201-300	1270	13.2 (3)	7.8 (2)	13.1 (2)	1.5 (5)	1.1 (9)	2.7 (8)	3.1 (3)	0.5 (6)	2.8 (5)	0.3 (7)	0.2 (7)	0.2 (6)	0.6 (6)	0.1 (15)	0.4 (10)
228	201-300	1428	67.1 (3)	4.6 (2)	597.6 (2)	2399.7 (6)	53.8 (10)	133.7 (6)	127.5 (7)	0.0 (7)	24.3 (6)	9.5 (7)	8.1 (5)	2.9 (8)	2.3 (6)	1.0 (3)	1.0 (5)
203	301-400	480	5.3 (2)	2.2 (2)	7.9 (2)	2.4 (2)	4.4 (3)	4.7 (3)	6.7 (2)	0.7 (3)	0.4 (2)	0.1 (3)	0.0 (2)	0.8 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	71.1 (2)	1507.5 (2)	21.2 (2)	6.9 (2)	10.5 (3)	5.4 (2)	29.8 (3)	17.5 (3)	0.3 (2)	1.2 (2)	1.2 (2)	2.0 (2)	0.0 (2)	0.4 (3)	1.1 (3)
211	301-400	330	25.3 (2)	24.0 (2)	47.4 (2)	778.5 (2)	23.5 (2)	0.3 (2)	58.6 (2)	89.1 (3)	1.0 (2)	4.8 (2)	1.1 (2)	4.5 (2)	1.1 (2)	0.6 (5)	0.6 (6)
216	301-400	384	2564.8 (2)	368.0 (2)	1068.8 (2)	105.5 (2)	281.5 (2)	197.3 (3)	335.3 (2)	109.7 (2)	357.2 (2)	218.2 (2)	70.4 (2)	18.8 (2)	3.8 (2)	4.3 (3)	3.5 (3)
222	301-400	441	1965.9 (2)	483.2 (2)	616.7 (2)	1504.7 (2)	970.2 (3)	1413.8 (3)	452.7 (3)	223.5 (2)	63.7 (2)	78.4 (2)	1438.5 (2)	10.1 (2)	3.2 (2)	0.6 (3)	3.7 (3)
229	301-400	567	94.3 (2)	239.4 (2)	385.9 (2)	984.0 (2)	668.5 (4)	579.8 (4)	176.4 (3)	147.2 (3)	408.2 (3)	10.1 (3)	3.0 (3)	37.0 (3)	5.1 (2)	5.7 (3)	3.3 (3)
204	401-500	354	10.5 (2)	6.3 (2)	NS	6.5 (2)	0.8 (3)	6.3 (3)	9.9 (2)	0.0 (2)	0.2 (2)	0.0 (2)	0.2 (2)	0.9 (2)	3.6 (2)	0.8 (3)	0.3 (3)
217	401-500	268	1049.1 (2)	235.6 (2)	579.9 (2)	92.0 (2)	284.0 (2)	302.9 (2)	NS	93.7 (2)	235.9 (2)	121.1 (2)	349.7 (2)	26.9 (2)	51.9 (2)	9.1 (3)	34.3 (3)
223	401-500	180	1572.3 (2)	308.7 (2)	716.9 (2)	565.6 (2)	427.6 (2)	332.4 (2)	342.7 (2)	382.1 (2)	653.9 (2)	95.3 (2)	489.1 (2)	41.6 (2)	13.5 (2)	11.9 (3)	10.8 (3)
227	401-500	686	963.0 (2)	157.0 (2)	158.4 (2)	11.1 (2)	119.0 (5)	86.8 (4)	72.6 (3)	57.6 (4)	205.7 (3)	40.1 (4)	6.6 (3)	7.2 (4)	135.0 (3)	10.2 (6)	11.6 (6)
235	401-500	420	5.1 (2)	24.2 (2)	26.5 (2)	5.4 (2)	9.0 (3)	17.1 (2)	49.5 (3)	7.3 (2)	2.3 (2)	10.7 (2)	19.5 (2)	1.6 (2)	56.9 (2)	7.0 (3)	2.3 (3)
212	501-750	664	3.0 (2)	6.5 (2)	0.9 (2)	2.9 (2)	4.5 (5)	4.1 (3)	11.3 (3)	3.0 (4)	3.8 (3)	1.0 (4)	0.0 (2)	0.4 (4)	1.4 (3)	1.2 (2)	2.2 (2)
218	501-750	420	691.8 (2)	NS	363.7 (2)	106.0 (2)	61.7 (2)	115.9 (2)	NS	52.3 (2)	45.4 (2)	221.1 (2)	232.3 (2)	69.2 (2)	33.2 (2)	4.9 (2)	61.8 (2)
224	501-750	270	853.6 (2)	476.5 (2)	339.3 (2)	234.0 (2)	106.4 (2)	119.2 (2)	141.3 (2)	26.4 (2)	157.4 (2)	144.3 (2)	317.8 (2)	13.2 (2)	7.8 (2)	12.5 (2)	15.1 (2)
230	501-750	237	1414.1 (2)	NS	193.3 (2)	88.5 (2)	144.7 (2)	78.4 (2)	80.2 (2)	77.7 (2)	336.5 (2)	156.3 (2)	42.6 (2)	83.8 (2)	172.3 (2)	37.8 (2)	25.2 (2)
219	751-1000	213	NS	NS	NS	9.1 (2)	NS	2.0 (2)	NS	0.0 (2)	15.3 (2)	0.4 (2)	1.6 (2)	0.0 (2)	3.6 (2)	0.0 (2)	0.7 (2)
231	751-1000	182	0.0 (2)	NS	2.3 (2)	NS	3.4 (2)	3.3 (2)	22.3 (2)	13.9 (2)	5.9 (2)	1.7 (2)	5.8 (2)	NS	0.0 (2)	0.7 (2)	2.7 (2)
236	751-1000	122	NS	NS	NS	4.9 (2)	3.5 (2)	3.2 (2)	5.3 (2)	13.7 (2)	5.4 (2)	2.6 (2)	0.0 (2)	NS	0.3 (2)	0.0 (2)	1.7 (2)
Stratified Analysis		Upper	411.3	812.8	715.6	981.6	132.9	253.0	101.9	53.5	98.7	51.3	322.1	11.6	26.5	3.9	5.3
		Mean	299.0	133.3	179.4	368.3	97.2	127.5	71.9	31.1	62.2	27.0	73.2	7.9	13.9	2.9	4.6
		Lower	186.6	-546.3	-356.8	-245.0	21.6	2.1	41.9	8.7	-25.6	2.7	-175.8	4.2	1.3	1.8	3.8
Converted Survey Biom.('000 tons)			**618.8**	**246.9**	**344.4**	**732.6**	**193.0**	**256.9**	**135.9**	**62.7**	**125.2**	**54.4**	**147.4**	**15.8**	**28.0**	**5.7**	**9.2**

2J Autumn 1978-1992 Mean Weight (kg) per tow

Table 2 Mean number of redfish per standard tow in Division 2J from 1993-1994 Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3 5 knots) Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3 0 knots) Number of successful sets in brackets 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.) 1978-1992	Area (sq.n.mi.) 1993-Onwards	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.3 (6)	0.3 (3)
214	201-300	1171	1341	0.0 (5)	0.2 (6)
215	201-300	1270	1302	1.0 (5)	0.2 (5)
228	201-300	1428	2196	0.3 (9)	0.7 (3)
203	301-400	480	487	1.0 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	4.0 (2)	1.5 (2)
222	301-400	441	450	1.5 (2)	3.3 (3)
229	301-400	567	536	7.0 (2)	0.3 (3)
204	401-500	354	288	0.5 (2)	4.3 (3)
217	401-500	268	241	28.5 (2)	29.7 (3)
223	401-500	180	158	22.6 (2)	3.0 (3)
227	401-500	686	598	12.8 (3)	3.8 (5)
235	401-500	420	414	4.0 (3)	10.7 (3)
212	501-750	664	557	5.0 (2)	2.0 (3)
218	501-750	420	362	25.0 (2)	34.0 (2)
224	501-750	270	228	77.0 (2)	49.3 (3)
230	501-750	237	185	9.0 (2)	74.0 (3)
219	751-1000	213	283	10.5 (2)	0.5 (2)
231	751-1000	182	186	2.5 (2)	2.7 (3)
236	751-1000	122	193	5.0 (2)	0.7 (3)
	Stratified Analysis:		Upper	18.6	11.7
			Mean	4.4	4.1
			Lower	-9.7	-3.4
	Total Survey Abundance (millions)			[illegible]	4.5

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	Area (sq.n.mi.)	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.5 (6)	0.3 (3)
214	201-300	1171	1341	0.0 (5)	0.3 (6)
215	201-300	1270	1302	3.8 (5)	1.2 (5)
228	201-300	1428	2196	2.1 (9)	4.3 (3)
203	301-400	480	487	3.0 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	10.5 (2)	6.0 (2)
222	301-400	441	450	4.5 (2)	8.0 (3)
229	301-400	567	536	21.0 (2)	3.7 (3)
204	401-500	354	288	1.5 (2)	14.3 (3)
217	401-500	268	241	70.0 (2)	67.7 (3)
223	401-500	180	158	52.5 (2)	5.7 (3)
227	401-500	686	598	26.7 (3)	8.4 (5)
235	401-500	420	414	9.0 (3)	26.3 (3)
212	501-750	664	557	12.0 (2)	5.0 (3)
218	501-750	420	362	48.0 (2)	65.0 (2)
224	501-750	270	228	162.5 (2)	100.3 (3)
230	501-750	237	185	17.0 (2)	140.3 (3)
219	751-1000	213	283	17.0 (2)	0.5 (2)
231	751-1000	182	186	3.5 (2)	3.7 (3)
236	751-1000	122	193	8.0 (2)	1.0 (3)
	Stratified Analysis:		Upper	40.3	14.6
			Mean	10.0	9.3
			Lower	-20.2	3.9
	Converted Survey Abundance (millions)			[illegible]	[illegible]

2J Autumn 1993-1994 Mean Number per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

Table 3. Mean weight (kg) of redfish per standard tow in Division 2J from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots. Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets, 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	0.1 (2)	0.0 (2)	3.7 (2)	0.5 (6)	0.0 (11)	0.1 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.0 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	1.5 (3)	3.2 (2)	1.0 (2)	0.0 (3)	2.9 (6)	0.8 (2)	2.0 (4)	0.0 (4)	0.1 (3)	0.2 (4)	0.5 (3)	0.0 (4)	0.0 (3)	0.1 (7)	0.2 (7)
213	201-300	1725	55.0 (3)	85.9 (3)	0.4 (3)	2.8 (6)	4.6 (10)	92.8 (10)	42.3 (5)	1.0 (9)	0.0 (9)	0.5 (9)	0.4 (8)	0.0 (9)	0.1 (8)	0.1 (14)	0.0 (19)
214	201-300	1171	75.2 (3)	4.5 (2)	0.0 (2)	54.1 (5)	28.2 (8)	32.0 (8)	0.4 (4)	0.7 (6)	1.6 (6)	1.6 (6)	2.7 (6)	0.2 (6)	0.2 (5)	0.1 (15)	0.2 (14)
215	201-300	1270	9.6 (3)	6.0 (2)	7.5 (2)	1.2 (5)	0.4 (9)	1.7 (8)	2.3 (3)	0.2 (6)	1.4 (5)	0.3 (7)	0.1 (7)	0.1 (6)	0.2 (6)	0.1 (15)	0.2 (10)
228	201-300	1428	28.0 (3)	3.3 (2)	437.5 (2)	1548.5 (6)	31.6 (10)	103.5 (6)	88.4 (7)	0.0 (7)	17.9 (6)	6.6 (7)	5.8 (5)	1.6 (8)	1.1 (6)	0.7 (3)	0.2 (5)
203	301-400	480	1.3 (2)	0.7 (2)	3.3 (2)	0.8 (2)	2.4 (3)	1.5 (3)	3.8 (2)	0.1 (3)	0.3 (2)	0.0 (3)	0.0 (2)	0.5 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	42.4 (2)	1540.4 (2)	17.8 (2)	26.0 (2)	7.2 (3)	2.9 (2)	20.0 (3)	11.5 (3)	0.2 (2)	0.6 (2)	1.2 (2)	1.7 (2)	0.0 (2)	0.1 (3)	0.7 (3)
211	301-400	330	18.8 (2)	19.3 (2)	46.0 (2)	987.0 (2)	13.8 (2)	0.1 (2)	38.3 (2)	64.8 (3)	0.9 (2)	3.5 (2)	1.1 (2)	2.4 (2)	0.7 (2)	0.4 (5)	0.3 (6)
216	301-400	384	2209.5 (2)	267.7 (2)	590.2 (2)	69.5 (2)	195.8 (2)	133.7 (3)	272.5 (2)	70.6 (2)	227.1 (2)	141.5 (2)	50.0 (2)	8.4 (2)	3.1 (2)	2.5 (3)	1.7 (3)
222	301-400	441	1331.5 (2)	303.0 (2)	402.5 (2)	1033.8 (2)	582.0 (3)	963.5 (3)	303.3 (3)	152.5 (2)	47.1 (2)	63.0 (2)	1084.3 (2)	6.2 (2)	1.9 (2)	0.4 (3)	1.8 (3)
229	301-400	567	69.6 (2)	181.4 (2)	285.3 (2)	769.3 (2)	432.9 (4)	364.1 (4)	131.8 (3)	50.2 (3)	321.5 (3)	6.7 (3)	2.1 (3)	26.1 (3)	3.3 (2)	1.5 (3)	1.5 (3)
204	401-500	354	5.7 (2)	7.0 (2)	NS	3.4 (2)	0.4 (3)	2.6 (3)	5.0 (2)	0.0 (2)	0.2 (2)	0.0 (2)	0.3 (2)	0.6 (2)	2.2 (2)	0.6 (3)	0.1 (3)
217	401-500	268	704.9 (2)	164.3 (2)	470.6 (2)	73.8 (2)	214.0 (2)	239.8 (2)	NS	73.5 (2)	181.6 (2)	92.5 (2)	272.8 (2)	20.2 (2)	22.6 (2)	4.9 (3)	13.8 (3)
223	401-500	180	1131.3 (2)	221.9 (2)	536.5 (2)	459.2 (2)	356.2 (2)	271.0 (2)	247.0 (2)	328.8 (2)	606.8 (2)	76.3 (2)	449.3 (2)	28.7 (2)	7.4 (2)	6.6 (3)	4.8 (3)
227	401-500	686	714.0 (2)	148.5 (2)	159.3 (2)	8.0 (2)	99.9 (5)	70.9 (4)	57.3 (3)	45.5 (4)	199.2 (3)	38.9 (4)	5.0 (3)	5.2 (4)	105.5 (3)	5.0 (6)	5.6 (6)
235	401-500	420	3.0 (2)	17.0 (2)	23.5 (2)	4.3 (2)	6.2 (3)	13.3 (2)	38.0 (3)	5.0 (2)	1.0 (2)	8.5 (2)	15.3 (2)	1.4 (2)	52.4 (2)	4.5 (3)	1.1 (3)
212	501-750	664	3.4 (2)	4.8 (2)	0.6 (2)	2.8 (2)	3.4 (5)	2.7 (3)	9.0 (3)	1.6 (4)	2.8 (3)	0.8 (4)	0.0 (2)	0.2 (4)	0.7 (3)	4.8 (2)	1.1 (2)
218	501-750	420	611.7 (2)	NS	314.5 (2)	92.0 (2)	55.5 (2)	99.3 (2)	NS	41.3 (2)	44.3 (2)	194.0 (2)	245.8 (2)	54.0 (2)	24.8 (2)	3.4 (2)	27.3 (2)
224	501-750	270	836.9 (2)	425.0 (2)	293.3 (2)	204.8 (2)	99.0 (2)	110.8 (2)	114.5 (2)	26.3 (2)	151.4 (2)	138.0 (2)	326.3 (2)	9.8 (2)	5.6 (2)	7.0 (2)	9.6 (2)
230	501-750	237	1160.5 (2)	NS	196.5 (2)	79.8 (2)	134.2 (2)	74.5 (2)	63.3 (2)	72.0 (2)	326.5 (2)	151.0 (2)	50.3 (2)	80.3 (2)	141.0 (2)	25.2 (2)	15.0 (2)
219	751-1000	213	NS	NS	NS	8.0 (2)	NS	1.9 (2)	NS	0.0 (2)	(2)	0.2 (2)	1.5 (2)	0.0 (2)	2.6 (2)	0.0 (2)	0.7 (2)
231	751-1000	182	0.0 (2)	NS	3.0 (2)	NS	3.5 (2)	2.3 (2)	17.8 (2)	9.8 (2)	6.2 (2)	1.6 (2)	5.3 (2)	NS	0.0 (2)	0.7 (2)	2.1 (2)
236	751-1000	122	NS	NS	NS	3.8 (2)	2.8 (2)	3.0 (2)	4.8 (2)	12.5 (2)	6.3 (2)	2.4 (2)	0.0 (2)	NS	0.4 (2)	0.0 (2)	1.6 (2)
Stratified Analysis		Upper	370.0	779.7	468.9	659.6	114.7	172.8	71.6	43.2	81.9	40.8	249.0	9.8	20.9	2.2	2.5
		Mean	224.8	112.7	131.4	260.4	66.1	88.3	50.8	21.2	51.8	22.2	59.5	5.9	10.6	1.6	2.2
		Lower	79.6	-554.3	-206.1	-138.7	17.4	3.8	30.0	-0.8	21.7	3.5	-129.9	1.9	0.4	1.1	1.8
Total Survey Biomass ('000 tons)			293.86	113.0	137.8	262.7	71.3	97.1	52.4	23.5	57.0	24.4	66.4	6.5	11.7	1.9	2.4

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
209	201-300	1608	0.4 (2)	0.0 (2)	3.6 (2)	0.4 (6)	0.0 (11)	0.2 (7)	0.1 (7)	0.1 (9)	0.0 (7)	0.1 (8)	0.0 (5)	0.0 (8)	0.0 (6)	0.0 (7)	0.0 (5)
210	201-300	774	10.6 (3)	4.4 (2)	1.8 (2)	0.0 (3)	5.7 (6)	0.7 (2)	6.0 (4)	0.1 (4)	0.2 (3)	0.0 (4)	1.4 (3)	0.0 (4)	0.0 (3)	0.1 (7)	0.4 (7)
213	201-300	1725	107.8 (3)	129.7 (3)	0.6 (3)	4.7 (6)	6.5 (10)	158.3 (10)	73.7 (5)	1.1 (9)	0.0 (9)	0.8 (9)	0.6 (8)	0.0 (9)	0.2 (8)	0.2 (14)	0.0 (19)
214	201-300	1171	131.8 (3)	4.6 (2)	0.0 (2)	79.6 (5)	41.0 (8)	45.3 (8)	0.5 (4)	1.0 (6)	2.4 (6)	1.8 (6)	3.3 (6)	0.3 (6)	0.4 (5)	0.3 (15)	0.4 (14)
215	201-300	1270	13.2 (3)	7.8 (2)	13.1 (2)	1.5 (5)	1.1 (9)	2.7 (8)	3.1 (3)	0.5 (6)	2.8 (5)	0.3 (7)	0.2 (7)	0.2 (6)	0.6 (6)	0.1 (15)	0.4 (10)
228	201-300	1428	67.1 (3)	4.6 (2)	597.6 (2)	2399.7 (6)	53.8 (10)	133.7 (6)	127.5 (7)	0.0 (7)	24.3 (6)	9.5 (7)	8.1 (5)	2.9 (8)	2.3 (6)	1.0 (3)	1.0 (5)
203	301-400	480	5.3 (2)	2.2 (2)	7.9 (2)	2.4 (2)	4.4 (3)	4.7 (3)	6.7 (2)	0.7 (3)	0.4 (2)	0.1 (3)	0.0 (2)	0.8 (3)	0.0 (2)	0.0 (3)	0.0 (3)
208	301-400	448	71.1 (2)	1507.5 (2)	21.2 (2)	6.9 (2)	10.5 (3)	5.4 (2)	29.8 (3)	17.5 (3)	0.3 (2)	1.2 (2)	1.2 (2)	2.0 (2)	0.0 (2)	0.4 (3)	1.1 (3)
211	301-400	330	25.3 (2)	24.0 (2)	47.4 (2)	778.5 (2)	23.5 (2)	0.3 (2)	58.6 (2)	89.1 (3)	1.0 (2)	4.8 (2)	1.1 (2)	4.5 (2)	1.1 (2)	0.6 (5)	0.6 (6)
216	301-400	384	2564.8 (2)	368.0 (2)	1068.8 (2)	105.5 (2)	281.5 (2)	197.3 (3)	335.3 (2)	109.7 (2)	357.2 (2)	218.2 (2)	70.4 (2)	18.8 (2)	3.8 (2)	4.3 (3)	3.5 (3)
222	301-400	441	1965.9 (2)	483.2 (2)	616.7 (2)	1504.7 (2)	970.2 (3)	1413.8 (3)	452.7 (3)	223.5 (2)	63.7 (2)	78.4 (2)	1438.5 (2)	10.1 (2)	3.2 (2)	0.6 (3)	3.7 (3)
229	301-400	567	94.3 (2)	239.4 (2)	385.9 (2)	984.0 (2)	668.5 (4)	579.8 (4)	176.4 (3)	147.2 (3)	408.2 (3)	10.1 (3)	3.0 (3)	37.0 (3)	5.1 (2)	5.7 (3)	3.3 (3)
204	401-500	354	10.5 (2)	6.3 (2)	NS	6.5 (2)	0.8 (3)	6.3 (3)	9.9 (2)	0.0 (2)	0.2 (2)	0.0 (2)	0.2 (2)	0.9 (2)	3.6 (2)	0.8 (3)	0.3 (3)
217	401-500	268	1049.1 (2)	235.6 (2)	579.9 (2)	92.0 (2)	284.0 (2)	302.9 (2)	NS	93.7 (2)	235.9 (2)	121.1 (2)	349.7 (2)	26.9 (2)	51.9 (2)	9.1 (3)	34.3 (3)
223	401-500	180	1572.3 (2)	308.7 (2)	716.9 (2)	565.6 (2)	427.6 (2)	332.4 (2)	342.7 (2)	382.1 (2)	653.9 (2)	95.3 (2)	489.1 (2)	41.6 (2)	13.5 (2)	11.9 (3)	10.8 (3)
227	401-500	686	963.0 (2)	157.0 (2)	158.4 (2)	11.1 (2)	119.0 (5)	86.8 (4)	72.6 (3)	57.6 (4)	205.7 (3)	40.1 (4)	6.6 (3)	7.2 (4)	135.0 (3)	10.2 (6)	11.6 (6)
235	401-500	420	5.1 (2)	24.2 (2)	26.5 (2)	5.4 (2)	9.0 (3)	17.1 (2)	49.5 (3)	7.3 (2)	2.3 (2)	10.7 (2)	19.5 (2)	1.6 (2)	56.9 (2)	7.0 (3)	2.3 (3)
212	501-750	664	3.0 (2)	6.5 (2)	0.9 (2)	2.9 (2)	4.5 (5)	4.1 (3)	11.3 (3)	3.0 (4)	3.8 (3)	1.0 (4)	0.0 (2)	0.4 (4)	1.4 (3)	7.2 (2)	2.2 (2)
218	501-750	420	691.8 (2)	NS	363.7 (2)	106.0 (2)	61.7 (2)	115.9 (2)	NS	52.3 (2)	45.4 (2)	221.1 (2)	232.3 (2)	69.2 (2)	33.2 (2)	4.9 (2)	61.8 (2)
224	501-750	270	853.6 (2)	476.5 (2)	339.3 (2)	234.0 (2)	106.4 (2)	119.2 (2)	141.3 (2)	26.4 (2)	157.4 (2)	144.3 (2)	317.8 (2)	13.2 (2)	7.8 (2)	12.5 (2)	15.1 (2)
230	501-750	237	1414.1 (2)	NS	193.3 (2)	88.5 (2)	144.7 (2)	78.4 (2)	80.2 (2)	77.7 (2)	336.5 (2)	156.3 (2)	42.6 (2)	93.9 (2)	172.3 (2)	37.8 (2)	25.2 (2)
219	751-1000	213	NS	NS	NS	9.1 (2)	NS	2.0 (2)	NS	0.0 (2)	15.3 (2)	0.4 (2)	1.6 (2)	0.0 (2)	3.6 (2)	0.0 (2)	0.7 (2)
231	751-1000	182	0.0 (2)	NS	2.3 (2)	NS	3.4 (2)	3.3 (2)	22.3 (2)	13.9 (2)	5.9 (2)	1.7 (2)	5.8 (2)	NS	0.0 (2)	0.7 (2)	2.7 (2)
236	751-1000	122	NS	NS	NS	4.9 (2)	3.5 (2)	3.2 (2)	5.3 (2)	13.7 (2)	5.4 (2)	2.6 (2)	0.0 (2)	NS	0.3 (2)	0.0 (2)	1.7 (2)
Stratified Analysis		Upper	411.3	812.9	715.6	981.6	172.9	253.0	101.9	53.5	98.7	51.3	322.1	11.6	26.5	3.9	5.3
		Mean	299.0	133.3	179.4	368.3	97.2	127.5	71.9	31.1	62.2	27.0	73.2	7.9	13.9	2.9	4.6
		Lower	186.6	-546.3	-356.8	-245.0	21.6	2.1	41.9	8.7	25.6	2.7	-175.8	4.2	1.3	1.8	3.8
Converted Survey Biom('000 tons)			518.8	248.9	344.4	732.8	193.0	256.9	136.9	62.7	124.3	64.4	147.8	15.8	29.8	5.7	9.5

2J Autumn 1978-1992 Mean Weight (kg) per tow

Table 4. Mean number of redfish per standard tow in Division 2J from 1993-1994. Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets, 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.) 1978-1992	Area (sq.n.mi.) 1993-Onwards	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.0 (6)	0.4 (3)
214	201-300	1171	1341	0.0 (5)	0.0 (6)
215	201-300	1270	1302	0.1 (5)	0.0 (5)
228	201-300	1428	2196	0.0 (9)	0.1 (3)
203	301-400	480	487	0.1 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	0.8 (2)	0.1 (2)
222	301-400	441	450	0.4 (2)	1.2 (3)
229	301-400	567	536	1.1 (2)	0.0 (3)
204	401-500	354	288	0.1 (2)	0.4 (3)
217	401-500	268	241	5.2 (2)	6.5 (3)
223	401-500	180	158	4.8 (2)	1.1 (3)
227	401-500	686	598	3.4 (3)	1.2 (5)
236	401-500	420	414	1.0 (3)	2.6 (3)
212	501-750	664	557	1.3 (2)	0.4 (3)
218	501-750	420	362	7.7 (2)	9.4 (2)
224	501-750	270	228	18.0 (2)	12.4 (3)
230	501-750	237	185	2.7 (2)	20.8 (3)
219	751-1000	213	283	4.3 (2)	0.2 (2)
231	751-1000	182	186	1.3 (2)	1.2 (3)
238	751-1000	122	193	2.1 (2)	0.3 (3)
	Stratified Analysis		Upper	4.6	1.9
			Mean	1.1	1.1
			Lower	-2.5	0.3
	Total Survey Biomass ('000 tons)			1.2	1.1

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	Area (sq.n.mi.)	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.3 (6)	0.4 (3)
214	201-300	1171	1341	0.0 (5)	0.1 (6)
215	201-300	1270	1302	0.3 (5)	0.1 (5)
228	201-300	1428	2196	0.1 (8)	0.3 (3)
203	301-400	480	487	0.4 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	1.7 (2)	0.4 (2)
222	301-400	441	450	0.9 (2)	1.6 (3)
229	301-400	567	536	2.5 (2)	0.1 (3)
204	401-500	354	288	0.2 (2)	1.5 (3)
217	401-500	268	241	12.3 (2)	13.3 (3)
223	401-500	180	158	10.5 (2)	1.7 (3)
227	401-500	686	598	6.1 (3)	1.9 (5)
236	401-500	420	414	1.9 (3)	4.7 (3)
212	501-750	664	557	2.0 (2)	0.9 (3)
218	501-750	420	362	13.2 (2)	16.7 (2)
224	501-750	270	228	36.3 (2)	23.2 (3)
230	501-750	237	185	4.5 (2)	37.1 (3)
219	751-1000	213	283	6.1 (2)	0.2 (2)
231	751-1000	182	186	1.5 (2)	1.7 (3)
238	751-1000	122	193	2.7 (2)	0.4 (3)
	Stratified Analysis:		Upper	8.9	5.8
			Mean	2.1	2.0
			Lower	-4.7	-1.9
	Converted Survey Biomass ('000 tons)			2.3	2.0

2J Autumn 1993-1994 Mean Weight (kg) per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey. For further information see Bishop (1994), Murphy (1996))

Table 5. Mean number of redfish per standard tow in Division 3K from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets, 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	43.8 (5)	19.3 (3)	12.0 (3)	7.4 (10)	0.3 (9)	4.7 (10)	0.2 (13)	0.6 (14)	0.0 (9)	0.4 (14)	0.3 (12)	0.9 (15)	0.0 (8)	0.4 (14)	0.0 (3)
621	201-300	2859	8.6 (5)	3.0 (3)	8.0 (3)	1.4 (11)	1.5 (14)	0.3 (12)	0.5 (14)	1.2 (15)	0.5 (14)	0.3 (12)	0.1 (10)	0.1 (17)	NS	0.4 (5)	0.0 (3)
624	201-300	668	1171.0 (4)	173.0 (2)	11.5 (2)	18.0 (2)	5.3 (4)	3.8 (4)	15.8 (4)	3.0 (4)	4.5 (2)	2.3 (3)	2.3 (3)	1.3 (3)	3.0 (4)	0.0 (2)	0.3 (3)
634	201-300	1618	373.3 (4)	28.5 (2)	138.5 (2)	33.2 (7)	112.3 (11)	8899.8 (5)	48.6 (7)	27.6 (9)	45.4 (5)	12.9 (11)	10.5 (6)	13.6 (7)	0.0 (2)	2.8 (25)	0.4 (25)
635	201-300	1274	776.8 (4)	275.0 (3)	59.5 (2)	2927.2 (5)	6.0 (5)	4.3 (6)	43.6 (8)	13.0 (7)	6.3 (6)	4.0 (6)	3.2 (5)	30.1 (7)	NS	0.5 (4)	1.1 (3)
636	201-300	1455	964.8 (4)	118.5 (2)	3318.0 (2)	41.7 (6)	32.5 (10)	118.0 (6)	16.0 (8)	7.9 (8)	14.3 (4)	5.6 (7)	7.0 (6)	3.6 (5)	NS	0.3 (3)	0.7 (3)
637	201-300	1132	554.0 (5)	759.7 (3)	188.0 (2)	661.5 (6)	41.7 (7)	292.6 (5)	12.5 (6)	62.0 (7)	11.1 (4)	4.7 (6)	8.5 (8)	3.8 (5)	1.5 (2)	1.3 (6)	0.0 (3)
623	301-400	1027	51.0 (3)	NS	81.5 (2)	7.5 (4)	6.0 (5)	103.7 (6)	13.4 (5)	5.3 (6)	3.0 (4)	1.2 (5)	7.0 (5)	3.8 (6)	0.6 (5)	1.8 (6)	4.3 (3)
625	301-400	850	121.3 (3)	53.0 (2)	85.5 (2)	387.8 (4)	13.0 (2)	324.3 (3)	21.0 (5)	70.6 (5)	0.7 (3)	27.5 (4)	2.3 (4)	9.5 (4)	0.8 (4)	1.3 (3)	0.0 (3)
626	301-400	919	118.3 (3)	31.0 (2)	39.5 (2)	140.4 (5)	96.6 (5)	7.8 (4)	8.0 (6)	31.9 (5)	3.3 (4)	12.2 (5)	0.4 (5)	351.4 (5)	NS	2.3 (3)	0.3 (3)
628	301-400	1085	67.5 (2)	53.7 (3)	8.5 (2)	32.8 (6)	5.3 (6)	14.5 (6)	8.3 (7)	1.8 (6)	0.0 (3)	1.8 (5)	1.8 (5)	0.8 (4)	NS	0.7 (3)	0.0 (3)
629	301-400	499	508.0 (3)	NS	87.5 (2)	49.0 (3)	29.5 (2)	2070.3 (3)	25.0 (4)	20.8 (4)	16.0 (3)	17.7 (3)	10.5 (2)	3.3 (3)	NS	3.0 (4)	1.3 (3)
630	301-400	544	305.5 (2)	102.0 (2)	46.0 (2)	19.0 (2)	NS	119.0 (2)	212.0 (3)	21.9 (4)	36.9 (2)	1.7 (3)	0.7 (3)	2.0 (3)	NS	1.0 (3)	4.2 (3)
633	301-400	2179	6191.8 (4)	82.3 (4)	413.0 (3)	219.3 (8)	1393.0 (7)	817.7 (12)	155.3 (10)	921.5 (12)	40.7 (8)	24.8 (11)	30.9 (8)	15.7 (10)	44.7 (11)	129.3 (25)	3.9 (25)
638	301-400	2059	478.0 (3)	182.0 (2)	857.3 (3)	121.3 (8)	81.6 (15)	151.0 (11)	166.8 (10)	105.6 (11)	19.8 (4)	96.5 (10)	840.9 (8)	33.1 (11)	4.0 (2)	7.3 (25)	1.0 (25)
639	301-400	1463	798.8 (4)	2118.5 (2)	392.0 (2)	95.8 (6)	553.1 (10)	6536.4 (7)	753.9 (8)	733.0 (8)	1435.0 (6)	177.1 (7)	204.7 (6)	22.3 (8)	828.0 (3)	22.3 (3)	1.6 (25)
622	401-500	632	93.0 (2)	10.3 (3)	18.0 (2)	27.0 (2)	18.3 (3)	20.0 (2)	8.0 (4)	4.0 (4)	6.5 (2)	1.0 (3)	0.7 (3)	8.0 (3)	2.0 (2)	2.7 (3)	3.3 (3)
627	401-500	1184	4.5 (2)	25.7 (3)	45.5 (2)	7.0 (6)	16.0 (7)	23.0 (6)	12.4 (8)	3.7 (7)	2.6 (5)	2.0 (6)	1.0 (5)	31.2 (6)	NS	0.3 (3)	1.3 (3)
631	401-500	1202	10.0 (2)	28.0 (3)	50.3 (3)	19.0 (5)	9.0 (2)	47.8 (5)	431.8 (5)	167.1 (7)	13.6 (4)	8.7 (6)	14.5 (6)	18.7 (7)	10.0 (2)	9.7 (6)	23.3 (3)
640	401-500	198	1497.0 (2)	NS	1190.0 (2)	410.5 (2)	480.5 (2)	NS	279.5 (2)	552.0 (3)	202.0 (2)	268.0 (2)	388.5 (2)	51.5 (2)	NS	42.7 (3)	7.3 (3)
645	401-500	204	1774.5 (2)	NS	1280.5 (2)	538.0 (2)	710.3 (3)	1659.5 (2)	141.5 (2)	1328.7 (3)	NS	423.0 (2)	589.0 (2)	1948.0 (2)	206.2 (2)	63.0 (3)	15.7 (3)
641	501-750	584	693.5 (2)	154.0 (2)	399.0 (2)	199.5 (2)	186.3 (4)	55.7 (3)	100.0 (3)	111.3 (4)	NS	52.3 (3)	NS	NS	NS	34.0 (2)	6.0 (2)
646	501-750	333	2411.0 (2)	20.5 (2)	115.5 (2)	149.5 (2)	1185.0 (2)	960.0 (2)	471.0 (2)	272.3 (3)	NS	341.5 (2)	NS	NS	14.5 (2)	166.7 (3)	53.3 (3)
642	751-1000	931	1.0 (2)	NS	4.5 (2)	1.3 (3)	3.8 (6)	NS	5.3 (6)	11.4 (5)	NS	1.8 (5)	NS	NS	NS	0.0 (2)	1.5 (2)
647	751-1000	409	23.0 (2)	0.5 (2)	34.1 (2)	6.5 (2)	0.5 (2)	NS	NS	205.9 (3)	NS	NS	NS	NS	10.8 (2)	25.0 (3)	1.0 (3)
Stratified Analysis		Upper	1896.1	1499.8	2653.3	606.8	400.4	2542.8	174.3	256.3	294.6	53.1	244.8	254.4	398.7	31.7	6.4
		Mean	745.3	205.1	350.7	229.9	190.0	1090.3	108.2	157.2	95.8	32.6	92.2	39.6	84.1	16.7	3.0
		Lower	-405.4	-1089.6	-1951.9	-146.9	-20.4	-362.1	42.1	58.2	-103.1	12.2	-60.4	-175.3	-230.5	1.6	-0.4
Total Survey Abundance (millions)			1719.4	421.4	737.9	483.6	361.0	2167.3	224.3	330.7	183.7	67.9	176.3	78.8	184.1	34.1	5.1

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	184.0 (5)	91.0 (3)	54.0 (3)	20.4 (10)	1.4 (9)	10.4 (10)	0.4 (13)	4.7 (14)	0.0 (9)	1.4 (14)	3.2 (12)	4.5 (15)	0.0 (8)	1.4 (14)	0.0 (3)
621	201-300	2859	36.4 (5)	12.7 (3)	30.3 (3)	3.6 (11)	6.6 (14)	2.1 (12)	2.1 (14)	7.9 (15)	3.9 (14)	1.3 (12)	0.5 (10)	0.4 (17)	1.3 NS	2.8 (5)	0.0 (3)
624	201-300	668	5998.5 (4)	825.0 (2)	28.0 (2)	66.0 (2)	14.3 (4)	25.5 (4)	47.5 (4)	15.0 (4)	27.0 (2)	15.3 (3)	14.0 (3)	11.3 (3)	21.0 (4)	0.0 (2)	2.7 (3)
634	201-300	1618	1218.3 (4)	81.0 (2)	404.0 (2)	80.4 (7)	206.4 (11)	17406.0 (5)	108.3 (7)	59.6 (9)	88.0 (5)	27.5 (11)	22.0 (6)	37.1 (7)	6.9 (2)	9.4 (25)	1.9 (25)
635	201-300	1274	3467.8 (4)	647.7 (3)	220.0 (2)	4977.0 (5)	17.0 (5)	19.2 (6)	100.3 (8)	34.1 (7)	30.5 (6)	16.5 (6)	17.2 (5)	45.1 (7)	2.7 NS	5.5 (4)	8.3 (3)
636	201-300	1455	3511.0 (4)	381.0 (2)	4239.5 (2)	122.8 (6)	66.2 (10)	164.8 (6)	54.8 (8)	20.8 (8)	43.0 (4)	16.9 (7)	24.8 (6)	18.2 (5)	2.0 NS	0.3 (3)	6.7 (3)
637	201-300	1132	1896.6 (5)	1805.0 (3)	604.0 (2)	1034.2 (6)	80.0 (7)	472.2 (5)	42.5 (6)	114.4 (7)	41.8 (4)	18.5 (6)	37.5 (8)	12.0 (5)	2.2 (2)	6.8 (6)	0.0 (3)
623	301-400	1027	188.0 (3)	NS	198.5 (2)	17.8 (4)	11.2 (5)	137.2 (6)	29.8 (5)	12.3 (6)	11.8 (4)	3.2 (5)	46.8 (5)	21.3 (6)	1.2 (5)	6.5 (6)	19.7 (3)
625	301-400	850	370.0 (3)	164.5 (2)	137.0 (2)	484.3 (4)	35.5 (2)	436.3 (3)	40.4 (5)	135.6 (5)	1.3 (3)	48.0 (4)	12.8 (4)	46.3 (4)	2.0 (4)	4.0 (3)	0.0 (3)
626	301-400	919	269.0 (3)	68.5 (2)	70.0 (2)	239.6 (5)	236.0 (5)	21.8 (4)	22.5 (6)	58.8 (5)	18.5 (4)	36.6 (5)	1.0 (5)	498.6 (5)	0.0 NS	9.7 (3)	1.0 (3)
628	301-400	1085	107.5 (2)	57.3 (3)	9.5 (2)	59.8 (6)	11.3 (6)	21.0 (6)	12.1 (7)	4.2 (6)	0.0 (3)	6.4 (5)	6.8 (5)	1.8 (4)	0.0 NS	4.3 (3)	0.0 (3)
629	301-400	499	600.3 (3)	NS	151.5 (2)	94.7 (3)	61.5 (2)	3306.0 (3)	61.0 (4)	45.3 (4)	45.7 (3)	28.7 (3)	27.5 (2)	7.3 (3)	3132.5 NS	9.5 (4)	5.0 (3)
630	301-400	544	431.5 (2)	182.0 (2)	81.0 (2)	46.5 (2)	NS	236.0 (2)	320.0 (3)	33.8 (4)	67.0 (2)	2.7 (3)	2.0 (3)	6.7 (3)	11.0 NS	2.3 (3)	18.3 (3)
633	301-400	2179	11091.0 (4)	170.3 (4)	662.0 (3)	468.3 (8)	2511.3 (7)	1399.8 (12)	271.7 (10)	1529.9 (12)	64.1 (8)	53.1 (11)	98.1 (8)	39.3 (10)	98.6 (11)	217.0 (25)	12.3 (25)
638	301-400	2059	804.7 (3)	340.0 (2)	1516.3 (3)	247.8 (8)	158.1 (15)	279.1 (11)	288.8 (10)	177.7 (11)	64.8 (4)	139.3 (10)	1106.1 (8)	57.7 (11)	296.4 (2)	17.4 (25)	3.1 (25)
639	301-400	1463	1336.3 (4)	3501.5 (2)	555.5 (2)	228.5 (6)	1087.5 (10)	12649.0 (7)	1200.6 (8)	1331.4 (8)	2096.2 (6)	311.3 (7)	447.0 (6)	36.9 (8)	647.9 (3)	69.7 (3)	5.5 (25)
622	401-500	632	402.0 (2)	26.7 (3)	40.5 (2)	44.5 (2)	27.7 (3)	33.0 (2)	13.0 (4)	9.0 (4)	13.0 (2)	2.0 (3)	3.7 (3)	33.3 (3)	3.5 (2)	13.3 (3)	11.7 (3)
627	401-500	1184	9.5 (2)	59.3 (3)	89.5 (2)	14.0 (6)	35.0 (7)	38.0 (6)	26.4 (8)	8.6 (7)	6.8 (5)	4.5 (6)	2.0 (5)	53.7 (6)	31.8 NS	1.0 (3)	3.0 (3)
631	401-500	1202	19.5 (2)	57.0 (3)	96.3 (3)	38.2 (5)	17.5 (2)	81.0 (5)	781.0 (5)	270.7 (7)	26.5 (4)	17.0 (6)	37.7 (6)	45.0 (7)	13.3 (2)	24.8 (6)	63.0 (3)
640	401-500	198	2499.5 (2)	NS	1908.0 (2)	613.0 (2)	782.0 (2)	NS	475.0 (2)	817.0 (3)	457.5 (2)	491.0 (2)	804.0 (2)	112.5 (2)	229.5 NS	109.0 (3)	21.3 (3)
645	401-500	204	2622.5 (2)	NS	2019.0 (2)	848.5 (2)	1184.7 (3)	2620.5 (2)	239.0 (2)	2159.7 (3)	NS	625.5 (2)	1031.0 (2)	3771.0 (2)	413.0 (2)	142.0 (3)	40.7 (3)
641	501-750	584	918.0 (2)	220.0 (2)	512.5 (2)	287.0 (2)	266.8 (4)	71.7 (3)	129.7 (3)	168.8 (4)	NS	70.0 (3)	NS	NS	39.5 NS	62.5 (2)	12.0 (2)
646	501-750	333	3017.0 (2)	27.0 (2)	139.0 (2)	180.0 (2)	1510.5 (2)	1265.0 (2)	572.0 (2)	353.7 (3)	NS	390.5 (2)	NS	NS	23.0 (2)	345.0 (3)	116.3 (3)
642	751-1000	931	1.5 (2)	NS	5.0 (2)	2.0 (3)	6.5 (6)	NS	7.7 (6)	19.0 (5)	NS	2.2 (5)	NS	NS	4.3 NS	0.0 (2)	2.5 (2)
647	751-1000	409	26.0 (2)	0.5 (2)	57.0 (2)	11.0 (2)	0.5 (2)	NS	NS	234.7 (3)	NS	NS	NS	NS	13.5 (2)	37.0 (3)	1.7 (3)
Stratified Analysis		Upper	3765.5	2552.2	3560.2	1037.2	715.7	4898.1	292.3	433.4	439.0	85.2	344.1	459.7	969.4	58.0	18.5
		Mean	1637.1	410.6	547.5	399.8	342.4	2063.4	185.1	267.5	153.9	54.8	147.6	73.6	128.8	33.5	8.8
		Lower	-491.3	-1731.1	-2465.1	-237.5	-30.9	-771.3	77.9	101.5	-131.3	24.3	-48.9	-312.5	-711.8	9.1	-0.8
Converted Survey Abund(millions)			6228.6	1646.8	2116.2	1646.8	1293.8	7918.8	703.0	1036.8	648.8	328.6	638.8	330.8	488.4	128.2	26.1

3K Autumn 1978-1992 Mean Number per tow

Table 4 Mean number of redfish per standard tow in Division 2J from 1993-1994. Upper panel shows results of the Engels 145 otter trawl (Mv Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets. 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi) 1978-1992	Area (sq n mi) 1993-Onwards	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.0 (6)	0.4 (3)
214	201-300	1171	1341	0.0 (5)	0.0 (6)
215	201-300	1270	1302	0.1 (5)	0.0 (5)
228	201-300	1428	2196	0.0 (9)	0.1 (3)
203	301-400	480	487	0.1 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	0.8 (2)	0.1 (2)
222	301-400	441	450	0.4 (2)	1.2 (3)
229	301-400	567	536	1.1 (2)	0.0 (3)
204	401-500	354	288	0.1 (2)	0.4 (3)
217	401-500	268	241	5.2 (2)	6.5 (3)
223	401-500	180	158	4.8 (2)	1.1 (3)
227	401-500	686	598	3.4 (3)	1.2 (5)
235	401-500	420	414	1.0 (3)	2.6 (3)
212	501-750	664	557	1.3 (2)	0.4 (3)
218	501-750	420	362	7.7 (2)	9.4 (2)
224	501-750	270	228	18.0 (2)	12.4 (3)
230	501-750	237	185	2.7 (2)	20.8 (3)
219	751-1000	213	283	4.3 (2)	0.2 (2)
231	751-1000	182	186	1.3 (2)	1.2 (3)
236	751-1000	122	193	2.1 (2)	0.3 (3)
	Stratified Analysis		Upper	4.6	1.9
			Mean	1.1	1.1
			Lower	-2.5	0.3
	Total Survey Biomass ('000 tons)			1.2	1.2

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	Area (sq n mi)	1993	1994
209	201-300	1608	680	0.0 (3)	0.0 (2)
210	201-300	774	1035	0.0 (4)	0.0 (6)
213	201-300	1725	1583	0.3 (6)	0.4 (3)
214	201-300	1171	1341	0.0 (5)	0.1 (6)
215	201-300	1270	1302	0.3 (5)	0.1 (5)
228	201-300	1428	2196	0.1 (9)	0.3 (3)
203	301-400	480	487	0.4 (2)	0.0 (2)
208	301-400	448	588	0.0 (2)	0.0 (3)
211	301-400	330	251	0.0 (2)	0.0 (3)
216	301-400	384	360	1.7 (2)	0.4 (2)
222	301-400	441	450	0.9 (2)	1.6 (3)
229	301-400	567	536	2.5 (2)	0.1 (3)
204	401-500	354	288	0.2 (2)	1.5 (3)
217	401-500	268	241	12.3 (2)	13.3 (3)
223	401-500	180	158	10.5 (2)	1.7 (3)
227	401-500	686	598	6.1 (3)	1.9 (5)
235	401-500	420	414	1.9 (3)	4.7 (3)
212	501-750	664	557	2.0 (2)	0.9 (3)
218	501-750	420	362	13.2 (2)	16.7 (2)
224	501-750	270	228	36.3 (2)	23.2 (3)
230	501-750	237	185	4.5 (2)	37.1 (3)
219	751-1000	213	283	6.1 (2)	0.2 (2)
231	751-1000	182	186	1.5 (2)	1.7 (3)
236	751-1000	122	193	2.7 (2)	0.4 (3)
	Stratified Analysis		Upper	8.9	5.8
			Mean	2.1	2.0
			Lower	-4.7	-1.9
	Converted Survey Biomass ('000 tons)			4.2	4.0

2J Autumn 1993-1994 Mean Weight (kg) per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

Table 5 Mean number of redfish per standard tow in Division 3K from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets, 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	43.8 (5)	19.3 (3)	12.0 (3)	7.4 (10)	0.3 (9)	4.7 (10)	0.2 (13)	0.6 (14)	0.0 (9)	0.4 (14)	0.3 (12)	0.9 (15)	0.0 (8)	0.4 (14)	0.0 (3)
621	201-300	2859	8.6 (5)	3.0 (3)	8.0 (3)	1.4 (11)	1.5 (14)	0.3 (12)	0.5 (14)	1.2 (15)	0.5 (14)	0.3 (12)	0.1 (10)	0.1 (17)	NS	0.4 (5)	0.0 (3)
624	201-300	668	1171.0 (4)	173.0 (2)	11.5 (2)	18.0 (2)	5.3 (4)	3.8 (4)	15.8 (4)	3.0 (4)	4.5 (2)	2.3 (3)	2.3 (3)	1.3 (3)	3.0 (4)	0.0 (2)	0.3 (3)
634	201-300	1618	373.3 (4)	28.5 (2)	138.5 (2)	33.2 (7)	112.3 (11)	8899.8 (5)	48.6 (7)	27.6 (9)	45.4 (5)	12.9 (11)	10.5 (6)	13.6 (7)	0.0 (2)	2.8 (25)	0.4 (25)
635	201-300	1274	776.8 (4)	275.0 (3)	59.5 (2)	2927.2 (5)	6.0 (5)	4.3 (6)	43.6 (8)	13.0 (7)	6.3 (6)	4.0 (6)	3.2 (5)	30.1 (7)	NS	0.5 (4)	1.1 (3)
636	201-300	1455	964.8 (4)	118.5 (2)	3318.0 (2)	41.7 (6)	32.5 (10)	118.0 (6)	16.0 (8)	7.9 (8)	14.3 (4)	5.6 (7)	7.0 (6)	3.6 (5)	NS	0.3 (3)	0.7 (3)
637	201-300	1132	554.0 (5)	759.7 (3)	188.0 (2)	661.5 (6)	41.7 (7)	282.6 (5)	12.5 (6)	62.0 (7)	11.1 (4)	4.7 (6)	8.5 (8)	3.8 (5)	1.5 (2)	1.3 (6)	0.0 (3)
623	301-400	1027	51.0 (3)	NS	81.5 (2)	7.5 (4)	6.0 (5)	103.7 (6)	13.4 (5)	5.3 (6)	3.0 (4)	1.2 (5)	7.0 (5)	3.8 (6)	0.6 (5)	1.8 (6)	4.3 (3)
625	301-400	850	121.3 (3)	53.0 (2)	85.5 (2)	387.8 (4)	13.0 (2)	324.3 (3)	21.0 (5)	70.6 (5)	0.7 (3)	27.5 (4)	2.3 (4)	9.5 (4)	0.8 (4)	1.3 (3)	0.0 (3)
626	301-400	919	118.3 (3)	31.0 (2)	39.5 (2)	140.4 (5)	96.6 (5)	7.8 (4)	8.0 (6)	31.9 (5)	3.3 (4)	12.2 (5)	0.4 (5)	351.4 (5)	NS	2.3 (3)	0.3 (3)
628	301-400	1085	67.5 (2)	53.7 (3)	8.5 (2)	32.8 (6)	5.3 (6)	14.5 (6)	8.3 (7)	1.8 (6)	0.0 (3)	1.8 (5)	0.8 (4)	NS	0.7 (3)	0.0 (3)
629	301-400	499	508.0 (3)	NS	87.5 (2)	49.0 (3)	29.5 (2)	2070.3 (3)	25.0 (4)	20.8 (4)	16.0 (3)	17.7 (3)	10.5 (2)	3.3 (3)	NS	3.0 (4)	1.3 (3)
630	301-400	544	305.5 (2)	102.0 (2)	46.0 (2)	19.0 (2)	NS	119.0 (2)	212.0 (3)	21.9 (4)	38.9 (2)	1.7 (3)	0.7 (3)	2.0 (3)	NS	1.0 (3)	4.2 (3)
633	301-400	2179	6191.8 (4)	82.3 (4)	413.0 (3)	219.3 (8)	1393.0 (7)	817.7 (12)	155.3 (10)	921.5 (12)	40.7 (8)	24.8 (11)	30.9 (8)	15.7 (10)	44.7 (11)	129.3 (25)	3.9 (25)
638	301-400	2059	478.0 (3)	182.0 (2)	857.3 (3)	121.3 (8)	81.6 (15)	151.0 (11)	166.8 (10)	105.6 (11)	19.8 (4)	96.5 (10)	840.9 (8)	33.1 (11)	4.0 (2)	7.3 (25)	1.0 (25)
639	301-400	1463	798.8 (4)	2118.5 (2)	392.0 (2)	95.8 (6)	553.1 (10)	6536.4 (7)	753.9 (8)	733.0 (8)	1435.0 (6)	177.1 (7)	204.7 (6)	22.3 (8)	828.0 (3)	22.3 (3)	1.6 (25)
622	401-500	632	93.0 (2)	10.3 (3)	18.0 (2)	27.0 (2)	18.3 (3)	20.0 (2)	8.0 (4)	4.0 (4)	6.5 (2)	1.0 (3)	0.7 (3)	8.0 (3)	2.0 (2)	2.7 (3)	3.3 (3)
627	401-500	1184	4.5 (2)	25.7 (3)	45.5 (2)	7.0 (6)	16.0 (7)	23.0 (6)	12.4 (8)	3.7 (7)	2.6 (5)	2.0 (6)	1.0 (5)	31.2 (6)	NS	0.3 (3)	1.3 (3)
631	401-500	1202	10.0 (2)	28.0 (3)	50.3 (3)	19.0 (5)	9.0 (2)	47.8 (5)	431.8 (5)	167.1 (7)	13.6 (4)	8.7 (6)	14.5 (6)	18.7 (7)	10.0 (2)	9.7 (6)	23.3 (3)
640	401-500	198	1497.0 (2)	NS	1190.0 (2)	410.5 (2)	480.5 (2)	NS	279.5 (2)	552.0 (3)	202.0 (2)	268.0 (2)	388.5 (2)	51.5 (2)	NS	42.7 (3)	7.3 (3)
645	401-500	204	1774.5 (2)	NS	1280.5 (2)	538.0 (2)	710.3 (3)	1659.5 (2)	141.5 (2)	1328.7 (3)	NS	423.0 (2)	589.0 (2)	1948.0 (2)	206.2 (2)	63.0 (3)	15.7 (3)
641	501-750	584	693.5 (2)	154.0 (2)	399.0 (2)	199.5 (2)	186.3 (4)	55.7 (3)	100.0 (3)	111.3 (4)	NS	52.3 (3)	NS	NS	NS	34.0 (2)	6.0 (2)
646	501-750	333	2411.0 (2)	20.5 (2)	115.5 (2)	149.5 (2)	1185.0 (2)	960.0 (2)	471.0 (2)	272.3 (3)	NS	341.5 (2)	NS	NS	14.5 (2)	166.7 (3)	53.3 (3)
642	751-1000	931	1.0 (2)	NS	4.5 (2)	1.3 (3)	3.8 (6)	NS	5.3 (6)	11.4 (5)	NS	1.8 (5)	NS	NS	NS	0.0 (2)	1.5 (2)
647	751-1000	409	23.0 (2)	0.5 (2)	34.1 (2)	6.5 (2)	0.5 (2)	NS	NS	205.9 (3)	NS	NS	NS	NS	10.8 (2)	25.0 (3)	1.0 (3)
Stratified Analysis		Upper	1896.1	1499.8	2653.3	606.8	400.4	2542.8	174.3	256.3	284.6	53.1	244.8	254.4	398.7	31.7	6.4
		Mean	745.3	205.1	350.7	229.9	190.0	1090.3	108.2	157.2	85.8	32.6	92.2	39.6	84.1	16.7	3.0
		Lower	-405.4	-1089.6	-1951.9	-146.9	-20.4	-362.1	-42.1	-58.2	-103.1	-12.2	-60.4	-175.3	-230.5	-1.6	-0.4
Total Survey Abundance (millions)			**1719.4**	**421.5**	**737.5**	**483.6**	**381.9**	**2167.2**	**224.3**	**330.7**	**183.7**	**67.6**	**178.3**	**78.5**	**104.1**	**35.1**	**6.2**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	184.0 (5)	91.0 (3)	54.0 (3)	20.4 (10)	1.4 (9)	10.4 (10)	0.4 (13)	4.7 (14)	0.0 (9)	1.4 (14)	3.2 (12)	4.5 (15)	0.0 (8)	1.4 (14)	0.0 (3)
621	201-300	2859	36.4 (5)	12.7 (3)	30.3 (3)	3.6 (11)	6.6 (14)	2.1 (12)	2.1 (14)	7.9 (15)	3.9 (14)	1.3 (12)	0.5 (10)	0.4 (17)	1.3 NS	2.8 (5)	0.0 (3)
624	201-300	668	5998.5 (4)	825.0 (2)	28.0 (2)	66.0 (2)	14.3 (4)	25.5 (4)	47.5 (4)	15.0 (4)	27.0 (2)	15.3 (3)	14.0 (3)	11.3 (3)	21.0 (4)	0.0 (2)	2.7 (3)
634	201-300	1618	1218.3 (4)	81.0 (2)	404.0 (2)	80.4 (7)	206.4 (11)	17406.0 (5)	108.3 (7)	59.6 (9)	88.0 (5)	27.5 (11)	22.0 (6)	37.1 (7)	6.9 (2)	9.4 (25)	1.9 (25)
635	201-300	1274	3467.8 (4)	647.7 (3)	220.0 (2)	4977.0 (5)	17.0 (5)	19.2 (6)	100.3 (8)	34.1 (7)	30.5 (6)	16.5 (6)	17.2 (5)	45.1 (7)	2.7 NS	5.5 (4)	8.3 (3)
636	201-300	1455	3511.0 (4)	381.0 (2)	4239.5 (2)	122.8 (6)	66.2 (10)	164.8 (6)	54.8 (8)	20.8 (8)	43.0 (4)	16.9 (7)	24.8 (6)	18.2 (5)	2.0 NS	0.3 (3)	6.7 (3)
637	201-300	1132	1896.6 (5)	1805.0 (3)	604.0 (2)	1034.2 (6)	80.0 (7)	472.2 (5)	42.5 (6)	114.4 (7)	41.8 (4)	18.5 (6)	37.5 (8)	12.0 (5)	2.2 (2)	6.8 (6)	0.0 (3)
623	301-400	1027	188.0 (3)	NS	198.5 (2)	17.8 (4)	11.2 (5)	137.2 (6)	29.8 (5)	12.3 (6)	11.8 (4)	3.2 (5)	46.8 (5)	21.3 (6)	1.2 (5)	6.5 (6)	19.7 (3)
625	301-400	850	370.0 (3)	164.5 (2)	137.0 (2)	484.3 (4)	35.5 (2)	436.3 (3)	40.4 (5)	135.6 (5)	1.3 (3)	48.0 (4)	12.8 (4)	46.3 (4)	2.0 (4)	4.0 (3)	0.0 (3)
626	301-400	919	269.0 (3)	68.5 (2)	70.0 (2)	239.6 (5)	236.0 (5)	21.8 (4)	22.5 (6)	58.8 (5)	18.5 (4)	36.6 (5)	1.0 (5)	498.6 (5)	0.0 NS	9.7 (3)	1.0 (3)
628	301-400	1085	107.5 (2)	57.3 (3)	9.5 (2)	59.8 (6)	11.3 (6)	21.0 (6)	12.1 (7)	4.2 (6)	0.0 (3)	6.4 (5)	6.8 (5)	1.8 (4)	0.0 NS	4.3 (3)	0.0 (3)
629	301-400	499	600.3 (3)	NS	151.5 (2)	94.7 (3)	61.5 (2)	3306.0 (3)	61.0 (4)	45.3 (4)	45.7 (3)	28.7 (3)	27.5 (2)	7.3 (3)	3132.5 NS	9.5 (4)	5.0 (3)
630	301-400	544	431.5 (2)	182.0 (2)	81.0 (2)	46.5 (2)	NS	236.0 (2)	320.0 (2)	33.8 (4)	67.0 (2)	2.7 (3)	2.0 (3)	6.7 (3)	11.0 NS	2.3 (3)	18.3 (3)
633	301-400	2179	11091.0 (4)	170.3 (4)	662.0 (3)	468.3 (8)	2511.3 (7)	1399.8 (12)	271.7 (10)	1529.9 (12)	84.1 (8)	53.1 (11)	88.1 (8)	39.3 (10)	98.6 (11)	217.0 (25)	12.3 (25)
638	301-400	2059	804.7 (3)	340.0 (2)	1516.3 (3)	247.8 (8)	158.1 (15)	279.1 (11)	288.2 (10)	177.7 (11)	64.8 (4)	139.3 (10)	1108.1 (8)	57.7 (11)	296.4 (2)	17.4 (25)	3.1 (25)
639	301-400	1463	1336.3 (4)	3501.5 (2)	555.5 (2)	228.5 (6)	1087.5 (10)	12649.0 (7)	1200.6 (8)	1331.4 (8)	2096.2 (6)	311.3 (7)	447.0 (8)	36.9 (8)	647.9 (3)	69.7 (3)	5.5 (25)
622	401-500	632	402.0 (2)	26.7 (3)	40.5 (2)	44.5 (2)	27.7 (3)	33.0 (2)	13.0 (4)	9.0 (4)	13.0 (2)	2.0 (3)	3.7 (3)	33.3 (3)	3.5 (2)	13.3 (3)	11.7 (3)
627	401-500	1184	9.5 (2)	59.3 (3)	89.5 (2)	14.0 (6)	35.0 (7)	38.0 (6)	26.4 (8)	8.6 (7)	6.8 (5)	4.5 (6)	2.0 (5)	53.7 (6)	31.8 NS	1.0 (3)	3.0 (3)
631	401-500	1202	19.5 (2)	57.0 (3)	96.3 (3)	38.2 (5)	17.5 (2)	81.0 (5)	781.0 (5)	270.7 (7)	26.5 (4)	17.0 (6)	37.7 (6)	45.0 (7)	13.3 (2)	24.8 (6)	63.0 (3)
640	401-500	198	2499.5 (2)	NS	1908.0 (2)	613.0 (2)	782.0 (2)	NS	475.0 (2)	817.0 (3)	457.5 (2)	491.0 (2)	804.0 (2)	112.5 (2)	229.5 NS	109.0 (3)	21.3 (3)
645	401-500	204	2622.5 (2)	NS	2019.0 (2)	848.5 (2)	1184.7 (3)	2620.5 (2)	239.0 (2)	2159.7 (3)	NS	625.5 (2)	1031.0 (2)	3771.0 (2)	413.0 (2)	142.0 (3)	40.7 (3)
641	501-750	584	918.0 (2)	220.0 (2)	512.5 (2)	287.0 (2)	266.8 (4)	71.7 (3)	129.7 (3)	168.8 (4)	NS	70.0 (3)	NS	NS	39.5 NS	62.5 (2)	12.0 (2)
646	501-750	333	3017.0 (2)	27.0 (2)	139.0 (2)	180.0 (2)	1510.5 (2)	1265.0 (2)	572.0 (2)	353.7 (3)	NS	390.5 (2)	NS	NS	23.0 (2)	345.0 (3)	116.3 (3)
642	751-1000	931	1.5 (2)	NS	5.0 (2)	2.0 (3)	6.5 (6)	NS	7.7 (6)	19.0 (5)	NS	2.2 (5)	NS	NS	4.3 NS	0.0 (2)	2.5 (2)
647	751-1000	409	28.0 (2)	0.5 (2)	57.0 (2)	11.0 (2)	3.5 (2)	NS	NS	234.7 (3)	NS	NS	NS	NS	13.5 (2)	37.0 (3)	1.7 (3)
Stratified Analysis		Upper	3765.5	2552.2	3560.2	1037.2	715.7	4898.1	292.3	433.4	439.0	85.2	344.1	459.7	969.4	58.0	18.5
		Mean	1637.1	410.6	547.5	399.8	342.4	2063.4	185.1	267.5	153.9	54.8	147.6	73.6	128.8	33.5	8.8
		Lower	491.3	1731.1	2466.1	237.6	30.9	771.3	77.9	101.5	131.3	24.3	48.9	312.5	711.8	9.1	0.8
Converted Survey Abund.millions			**6920.9**	**1546.2**	**2110.2**	**1540.8**	**1293.9**	**7515.9**	**703.0**	**1030.8**	**540.9**	**208.0**	**523.0**	**260.8**	**406.4**	**129.2**	**34.1**

3K Autumn 1978-1992 Mean Number per tow

Table 6 Mean number of redfish per standard tow in Division 3K from 1993-1994. Upper panel shows results of the Engel's 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots). Number of successful sets in brackets. 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi) 1978-1992	Area (sq n mi) 1993-Onwards	1993	1994
620	201 - 300	2709	2545	0 0 (3)	0 0 (5)
621	201 - 300	2859	2537	0 0 (3)	0 0 (3)
624	201 - 300	668	1105	1 4 (7)	0 0 (3)
634	201 - 300	1618	1555	1 0 (16)	0 8 (4)
635	201 - 300	1274	1274	0 7 (3)	0 0 (4)
636	201 - 300	1455	1455	0 7 (3)	0 0 (3)
637	201 - 300	1132	1132	0 0 (3)	0 1 (14)
623	301 - 400	1027	494	0 5 (4)	0 0 (3)
625	301 - 400	850	888	2 3 (3)	2 0 (3)
626	301 - 400	919	1113	0 0 (3)	0 0 (3)
628	301 - 400	1085	1085	0 7 (3)	0 0 (6)
629	301 - 400	499	495	0 7 (3)	1 3 (4)
630	301 - 400	544	332	0 0 (3)	0 3 (3)
633	301 - 400	2179	2067	3 8 (18)	1 6 (5)
638	301 - 400	2059	2059	1 0 (20)	0 8 (21)
639	301 - 400	1463	1463	2 3 (15)	3 5 (8)
622	401 - 500	632	691	1 8 (4)	1 2 (5)
627	401 - 500	1184	1255	1 0 (3)	0 9 (8)
631	401 - 500	1202	1321	1 7 (3)	2 5 (4)
640	401 - 500	198	69	22 3 (3)	28 0 (3)
645	401 - 500	204	216	19 0 (3)	16 7 (3)
641	501 - 750	584	230	27 7 (3)	15 7 (3)
646	501 - 750	333	325	21 7 (3)	42 3 (3)
642	751 -1000	931	418	2 0 (3)	0 7 (3)
647	751 -1000	409	360	1 3 (3)	10 7 (3)
	Stratified Analysis		Upper	2 3	2 7
			Mean	1 9	1 9
			Lower	1 4	1 0
	Total Survey Abundance (millions)			**4.0**	**3.9**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	Area (sq n mi)	1993	1994
620	201 - 300	2709	2545	0 0 (3)	0 0 (5)
621	201 - 300	2859	2537	0 0 (3)	0 0 (3)
624	201 - 300	668	1105	9 9 (7)	0 0 (3)
634	201 - 300	1618	1555	3 1 (16)	1 5 (4)
635	201 - 300	1274	1274	1 3 (3)	0 0 (4)
636	201 - 300	1455	1455	2 7 (3)	0 0 (3)
637	201 - 300	1132	1132	0 0 (3)	1 4 (14)
623	301 - 400	1027	494	1 3 (4)	0 0 (3)
625	301 - 400	850	888	6 7 (3)	8 7 (3)
626	301 - 400	919	1113	0 0 (3)	0 0 (3)
628	301 - 400	1085	1085	2 0 (3)	0 0 (6)
629	301 - 400	499	495	4 0 (3)	2 5 (4)
630	301 - 400	544	332	0 0 (3)	0 7 (3)
633	301 - 400	2179	2067	14 8 (18)	3 4 (5)
638	301 - 400	2059	2059	2 5 (20)	4 2 (21)
639	301 - 400	1463	1463	8 0 (15)	12 6 (8)
622	401 - 500	632	691	4 3 (4)	4 4 (5)
627	401 - 500	1184	1255	5 3 (3)	2 8 (8)
631	401 - 500	1202	1321	5 7 (3)	9 8 (4)
640	401 - 500	198	69	74 0 (3)	100 3 (3)
645	401 - 500	204	216	48 3 (3)	47 0 (3)
641	501 - 750	584	230	63 7 (3)	31 3 (3)
646	501 - 750	333	325	46 0 (3)	89 0 (3)
642	751 -1000	931	418	3 3 (3)	2 0 (3)
647	751 -1000	409	360	3 0 (3)	17 7 (3)
	Stratified Analysis		Upper	6 8	6 6
			Mean	5 5	5 0
			Lower	4 2	3 5
	Converted Survey Abundance (millions)			**21.8**	**19.8**

3K Autumn 1993-1994 Mean Number per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

Table 7. Mean weight (kg)of redfish per standard tow in Division 3K from 1978-1992. Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots. Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets, 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	13.7 (5)	2.3 (3)	2.2 (3)	1.8 (10)	0.1 (9)	2.0 (10)	0.1 (13)	0.1 (14)	0.0 (9)	0.1 (14)	0.0 (12)	0.1 (15)	0.0 (8)	0.1 (14)	0.0 (3)
621	201-300	2859	0.8 (5)	0.7 (3)	2.9 (3)	0.6 (11)	0.2 (14)	0.0 (12)	0.1 (14)	0.1 (15)	0.0 (14)	0.0 (12)	0.0 (10)	0.0 (17)	NS	0.0 (5)	0.0 (3)
624	201-300	668	82.2 (4)	13.6 (2)	5.0 (2)	1.8 (2)	1.5 (4)	0.6 (4)	5.1 (4)	0.7 (4)	0.9 (2)	0.1 (3)	0.2 (3)	0.0 (3)	0.2 (4)	0.0 (2)	0.0 (3)
634	201-300	1618	84.9 (4)	7.3 (2)	33.5 (2)	7.1 (7)	42.5 (11)	2293.6 (5)	18.6 (7)	9.7 (9)	17.4 (5)	4.0 (11)	3.5 (6)	4.0 (7)	0.0 (2)	0.7 (25)	0.1 (25)
635	201-300	1274	88.2 (4)	159.4 (3)	12.5 (2)	1192.0 (5)	2.5 (5)	2.3 (6)	18.5 (8)	4.6 (7)	0.8 (6)	1.4 (6)	0.3 (5)	19.5 (7)	NS	0.0 (4)	0.1 (3)
636	201-300	1455	239.7 (4)	24.0 (2)	2362.4 (2)	11.0 (6)	19.1 (10)	72.5 (6)	4.9 (8)	3.9 (8)	3.4 (4)	1.4 (7)	1.7 (6)	0.7 (5)	NS	0.3 (3)	0.0 (3)
637	201-300	1132	99.0 (5)	232.4 (3)	29.5 (2)	336.4 (6)	18.2 (7)	139.2 (5)	5.0 (6)	25.9 (7)	3.3 (4)	0.8 (6)	2.4 (8)	0.9 (5)	0.5 (2)	0.4 (6)	0.0 (3)
623	301-400	1027	6.5 (3)	NS	32.3 (2)	2.5 (4)	2.8 (5)	84.2 (6)	5.4 (5)	2.7 (6)	0.6 (4)	0.2 (5)	0.8 (5)	0.4 (6)	0.2 (5)	0.5 (6)	0.6 (3)
625	301-400	850	35.9 (3)	16.3 (2)	54.3 (2)	303.5 (4)	4.0 (2)	219.0 (3)	8.3 (5)	23.1 (5)	0.2 (3)	11.3 (4)	0.3 (4)	1.1 (4)	0.1 (4)	0.3 (3)	0.0 (3)
626	301-400	919	51.9 (3)	13.2 (2)	27.5 (2)	77.3 (5)	19.4 (5)	2.8 (4)	2.6 (6)	14.7 (5)	0.4 (4)	2.6 (5)	0.1 (5)	196.4 (5)	NS	0.5 (3)	0.0 (3)
628	301-400	1085	47.2 (2)	57.5 (3)	9.8 (2)	16.8 (6)	3.1 (6)	11.4 (6)	7.7 (7)	1.3 (6)	0.0 (3)	0.5 (5)	0.3 (5)	0.2 (4)	NS	0.0 (3)	0.0 (3)
629	301-400	499	445.6 (3)	NS	65.0 (2)	28.3 (3)	12.5 (2)	974.0 (3)	7.7 (4)	7.4 (4)	3.6 (3)	9.4 (3)	4.5 (2)	1.3 (3)	NS	0.8 (4)	0.2 (3)
630	301-400	544	212.2 (2)	56.7 (2)	20.5 (2)	6.3 (2)	NS	36.8 (2)	114.0 (3)	14.9 (4)	13.9 (2)	1.3 (3)	0.0 (3)	0.5 (3)	NS	0.4 (3)	0.5 (3)
633	301-400	2179	1496.1 (4)	35.2 (4)	137.0 (3)	56.6 (8)	508.5 (7)	295.4 (12)	62.5 (10)	364.3 (12)	15.1 (8)	7.9 (11)	9.0 (8)	4.2 (10)	14.0 (11)	52.5 (25)	0.6 (25)
638	301-400	2059	115.9 (3)	102.6 (2)	260.1 (3)	44.3 (8)	33.1 (15)	65.6 (11)	72.9 (10)	47.0 (11)	7.4 (4)	58.7 (10)	553.3 (8)	15.4 (11)	0.9 (2)	1.9 (25)	0.2 (25)
639	301-400	1463	352.2 (4)	863.5 (2)	280.0 (2)	28.1 (6)	177.4 (10)	1903.7 (7)	329.9 (8)	232.8 (8)	786.5 (6)	75.6 (7)	57.7 (6)	11.9 (8)	302.4 (3)	4.7 (3)	0.3 (25)
622	401-500	632	7.3 (2)	3.3 (3)	5.8 (2)	16.3 (2)	14.2 (3)	14.0 (2)	5.5 (4)	1.0 (4)	1.8 (2)	0.4 (3)	0.1 (3)	1.0 (3)	0.7 (2)	0.4 (3)	0.4 (3)
627	401-500	1184	2.7 (2)	7.9 (3)	10.8 (2)	3.0 (6)	4.2 (7)	10.6 (6)	4.7 (8)	0.7 (7)	0.5 (5)	0.5 (6)	0.2 (5)	11.7 (6)	NS	0.0 (3)	0.3 (3)
631	401-500	1202	6.1 (2)	9.3 (3)	16.9 (3)	5.8 (5)	2.5 (2)	23.0 (5)	140.1 (5)	73.1 (7)	4.3 (4)	3.1 (6)	3.6 (6)	5.7 (7)	1.1 (2)	1.8 (6)	3.6 (3)
640	401-500	198	488.5 (2)	NS	476.3 (2)	181.5 (2)	191.5 (2)	NS	96.0 (2)	257.4 (3)	57.0 (2)	96.3 (2)	131.0 (2)	14.3 (2)	NS	8.3 (3)	1.3 (3)
645	401-500	204	746.6 (2)	NS	503.7 (2)	204.3 (2)	249.0 (3)	623.5 (2)	51.3 (2)	468.7 (3)	NS	210.8 (2)	210.5 (2)	620.0 (2)	57.6 (2)	14.4 (3)	3.9 (3)
641	501-750	584	370.6 (2)	84.6 (2)	228.0 (2)	98.0 (2)	88.4 (4)	34.5 (3)	54.0 (3)	47.6 (4)	NS	30.2 (3)	NS	NS	NS	11.9 (2)	1.3 (2)
646	501-750	333	1398.4 (2)	13.2 (2)	77.0 (2)	103.3 (2)	684.0 (2)	512.0 (2)	313.0 (2)	153.2 (3)	NS	255.5 (2)	NS	NS	6.0 (2)	44.6 (3)	12.7 (3)
642	751-1000	931	0.6 (2)	NS	3.0 (2)	0.7 (3)	1.7 (6)	NS	2.8 (6)	4.2 (5)	NS	1.0 (5)	NS	NS	NS	0.0 (2)	0.6 (2)
647	751-1000	409	16.6 (2)	0.3 (2)	12.4 (2)	2.5 (2)	0.3 (2)	NS	NS	145.3 (3)	NS	NS	NS	NS	6.9 (2)	11.6 (3)	0.3 (3)
Stratified Analysis		Upper	441.9	622.0	1767.4	253.4	150.9	715.8	75.6	98.9	160.4	27.0	153.8	37.9	144.7	12.1	1.1
		Mean	203.3	83.2	191.4	98.1	72.0	328.8	46.1	61.3	49.5	16.2	51.7	16.5	30.0	5.8	0.5
		Lower	-35.3	-455.5	1384.7	-57.2	-6.9	-58.1	16.7	23.6	61.3	5.5	-50.4	-4.9	-84.8	-0.4	0.0
Total Survey Biomass ('000 tons)			**469.0**	**171.1**	**402.4**	**206.4**	**148.5**	**653.6**	**95.0**	**128.8**	**95.0**	**33.7**	**100.0**	**31.9**	**37.1**	**12.2**	**1.1**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	19.6 (5)	5.8 (3)	4.1 (3)	3.1 (10)	0.1 (8)	2.7 (10)	0.1 (13)	0.2 (14)	0.0 (9)	0.2 (14)	0.1 (12)	0.3 (15)	0.0 (8)	0.1 (14)	0.0 (3)
621	201-300	2859	2.9 (5)	1.3 (3)	3.9 (3)	0.7 (11)	0.5 (14)	0.1 (12)	0.2 (14)	0.3 (15)	0.1 (14)	0.1 (12)	0.0 (10)	0.0 (17)	0.1 NS	0.1 (5)	0.0 (3)
624	201-300	668	324.6 (4)	49.0 (2)	6.5 (2)	6.1 (2)	2.4 (4)	1.1 (4)	7.5 (4)	1.0 (4)	1.5 (2)	0.7 (3)	0.9 (3)	0.3 (3)	0.6 (4)	0.0 (2)	0.1 (3)
634	201-300	1618	153.8 (4)	11.5 (2)	59.7 (2)	14.8 (7)	60.0 (11)	4322.4 (5)	25.7 (7)	14.5 (9)	23.5 (5)	6.5 (11)	5.3 (6)	6.3 (7)	1.3 (2)	1.2 (25)	0.1 (25)
635	201-300	1274	244.6 (4)	165.7 (3)	24.2 (2)	1592.4 (5)	2.9 (5)	2.6 (6)	23.7 (8)	6.7 (7)	1.9 (6)	2.0 (6)	1.0 (5)	20.0 (7)	1.2 NS	0.1 (4)	0.3 (3)
636	201-300	1455	394.0 (4)	46.2 (2)	2327.3 (2)	18.3 (6)	20.1 (10)	7.7.2 (6)	7.2 (8)	4.9 (8)	6.1 (4)	2.4 (7)	3.0 (6)	1.2 (5)	0.3 NS	0.3 (3)	0.1 (3)
637	201-300	1132	219.3 (5)	360.7 (3)	67.3 (2)	399.4 (6)	23.5 (7)	174.4 (5)	6.1 (6)	35.2 (7)	4.8 (4)	1.7 (6)	3.6 (8)	1.6 (5)	0.4 (2)	0.5 (6)	0.0 (3)
623	301-400	1027	19.3 (3)	NS	42.3 (2)	3.7 (4)	3.5 (5)	74.6 (6)	7.4 (5)	3.2 (6)	1.2 (4)	0.6 (5)	2.0 (5)	1.1 (6)	0.3 (5)	0.9 (6)	1.6 (3)
625	301-400	850	57.0 (3)	23.5 (2)	54.7 (2)	283.3 (4)	6.1 (2)	227.7 (3)	11.6 (5)	36.3 (5)	0.4 (3)	15.5 (4)	0.8 (4)	3.0 (4)	0.3 (4)	0.5 (3)	0.0 (3)
626	301-400	919	67.7 (3)	17.2 (2)	26.7 (2)	86.1 (5)	41.8 (5)	3.9 (4)	3.5 (6)	18.0 (5)	1.0 (4)	5.0 (5)	0.2 (5)	224.7 (5)	0.0 NS	1.0 (3)	0.1 (3)
628	301-400	1085	49.2 (2)	46.6 (3)	7.9 (2)	18.6 (6)	3.7 (6)	11.0 (6)	6.8 (7)	1.6 (6)	0.0 (3)	0.9 (5)	0.7 (5)	0.4 (4)	0.0 NS	0.2 (3)	0.0 (3)
629	301-400	499	402.0 (3)	NS	59.8 (2)	29.2 (3)	16.4 (2)	1223.5 (3)	13.0 (4)	10.4 (4)	6.8 (3)	11.2 (3)	5.7 (2)	2.1 (3)	1518.5 NS	1.4 (4)	0.6 (3)
630	301-400	544	213.1 (2)	62.6 (2)	27.7 (2)	9.8 (2)	NS	60.2 (2)	131.7 (3)	15.9 (4)	21.8 (2)	1.4 (3)	0.2 (3)	0.8 (3)	0.7 NS	0.4 (3)	1.3 (3)
633	301-400	2179	3271.3 (4)	45.2 (4)	241.2 (3)	102.4 (8)	740.3 (7)	447.7 (12)	87.3 (10)	516.2 (12)	21.1 (8)	12.3 (11)	14.0 (8)	7.3 (10)	22.0 (11)	72.9 (25)	1.5 (25)
638	301-400	2059	271.7 (3)	112.1 (2)	447.4 (3)	62.9 (8)	44.7 (15)	83.4 (11)	94.0 (10)	61.7 (11)	9.6 (4)	62.4 (10)	568.2 (8)	19.1 (11)	133.5 (2)	3.4 (25)	0.4 (25)
639	301-400	1463	472.5 (4)	1170.5 (2)	267.3 (2)	44.0 (6)	283.9 (10)	3244.2 (7)	439.5 (8)	381.5 (8)	885.2 (6)	98.2 (7)	97.3 (6)	13.8 (8)	196.2 (3)	9.2 (3)	0.6 (25)
622	401-500	632	29.9 (2)	5.4 (3)	9.5 (2)	17.6 (2)	14.0 (3)	14.1 (2)	5.4 (4)	2.0 (4)	3.4 (2)	0.6 (3)	0.2 (3)	2.8 (3)	1.1 (2)	0.9 (3)	1.3 (3)
627	401-500	1184	2.9 (2)	12.7 (3)	21.7 (2)	4.0 (6)	7.9 (7)	13.5 (6)	6.6 (8)	1.9 (7)	1.1 (5)	1.0 (6)	0.5 (5)	17.5 (6)	5.6 NS	0.1 (3)	0.7 (3)
631	401-500	1202	6.8 (2)	15.0 (3)	26.4 (3)	9.4 (5)	4.7 (2)	29.2 (5)	223.8 (5)	98.0 (7)	7.1 (4)	4.4 (6)	6.3 (6)	9.0 (7)	1.3 (2)	4.2 (6)	9.1 (3)
640	401-500	198	843.4 (2)	NS	678.8 (2)	247.6 (2)	271.8 (2)	NS	151.7 (2)	334.8 (3)	94.1 (2)	141.1 (2)	196.1 (2)	24.1 (2)	49.0 NS	17.9 (3)	3.2 (3)
645	401-500	204	1075.3 (2)	NS	739.6 (2)	307.3 (2)	389.4 (3)	942.3 (2)	77.9 (2)	741.3 (3)	NS	258.4 (2)	319.6 (2)	985.4 (2)	101.3 (2)	28.4 (3)	6.8 (3)
641	501-750	584	463.6 (2)	95.3 (2)	273.0 (2)	124.7 (2)	115.2 (4)	37.9 (3)	65.9 (3)	67.1 (4)	NS	33.8 (3)	NS	NS	14.3 NS	18.2 (2)	2.9 (2)
646	501-750	333	1675.9 (2)	14.7 (2)	82.5 (2)	106.8 (2)	810.8 (2)	632.2 (2)	332.7 (2)	183.0 (3)	NS	248.2 (2)	NS	NS	8.0 (2)	78.8 (3)	24.9 (3)
642	751-1000	931	0.9 (2)	NS	3.2 (2)	0.8 (3)	2.3 (6)	NS	3.2 (6)	6.5 (5)	NS	1.1 (5)	NS	NS	1.5 NS	0.0 (2)	0.9 (2)
647	751-1000	409	18.0 (2)	0.3 (2)	18.8 (2)	3.8 (2)	0.2 (2)	NS	NS	150.0 (3)	NS	NS	NS	NS	7.1 (2)	15.1 (3)	0.5 (3)
Stratified Analysis		Upper	978.2	833.2	1805.1	333.7	216.2	1261.1	100.1	142.9	180.8	31.9	161.5	61.7	426.6	17.3	2.6
		Mean	383.8	110.2	220.2	127.6	103.2	562.2	61.8	87.9	57.3	19.4	57.5	22.0	51.0	8.7	1.2
		Lower	-210.6	-512.7	1364.8	-78.4	-9.8	-156.7	23.5	33.0	66.1	6.9	46.6	-17.7	-324.7	0.1	0.1
Converted Survey Biom('000 tons)			**1622.4**	**415.2**	**848.6**	**491.0**	**390.2**	**2011.4**	**234.7**	**338.9**	**201.6**	**73.6**	**203.7**	**78.0**	**196.5**	**33.6**	**4.7**

3K Autumn 1978-1992 Mean Weight (kg) per tow

Table 6. Mean number of redfish per standard tow in Division 3K from 1993-1994. Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets, 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.) 1978-1992	Area (sq.n.mi.) 1993-Onwards	1993	1994
620	201 - 300	2709	2545	0.0 (3)	0.0 (5)
621	201 - 300	2859	2537	0.0 (3)	0.0 (3)
624	201 - 300	668	1105	1.4 (7)	0.0 (3)
634	201 - 300	1618	1555	1.0 (16)	0.8 (4)
635	201 - 300	1274	1274	0.7 (3)	0.0 (4)
636	201 - 300	1455	1455	0.7 (3)	0.0 (3)
637	201 - 300	1132	1132	0.0 (3)	0.1 (14)
623	301 - 400	1027	494	0.5 (4)	0.0 (3)
625	301 - 400	850	888	2.3 (3)	2.0 (3)
626	301 - 400	919	1113	0.0 (3)	0.0 (3)
628	301 - 400	1085	1085	0.7 (3)	0.0 (6)
629	301 - 400	499	495	0.7 (3)	1.3 (4)
630	301 - 400	544	332	0.0 (3)	0.3 (3)
633	301 - 400	2179	2067	3.8 (18)	1.6 (5)
638	301 - 400	2059	2059	1.0 (20)	0.8 (21)
639	301 - 400	1463	1463	2.3 (15)	3.5 (8)
622	401 - 500	632	691	1.8 (4)	1.2 (5)
627	401 - 500	1184	1255	1.0 (3)	0.9 (8)
631	401 - 500	1202	1321	1.7 (3)	2.5 (4)
640	401 - 500	198	69	22.3 (3)	29.0 (3)
645	401 - 500	204	216	19.0 (3)	16.7 (3)
641	501 - 750	584	230	27.7 (3)	15.7 (3)
646	501 - 750	333	325	21.7 (3)	42.3 (3)
642	751 -1000	931	418	2.0 (3)	0.7 (3)
647	751 -1000	409	360	1.3 (3)	10.7 (3)
	Stratified Analysis:		Upper	2.3	2.7
			Mean	1.9	1.9
			Lower	1.4	1.0
	Total Survey Abundance (millions)			4.8	3.9

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	Area (sq.n.mi.)	1993	1994
620	201 - 300	2709	2545	0.0 (3)	0.0 (5)
621	201 - 300	2859	2537	0.0 (3)	0.0 (3)
624	201 - 300	668	1105	9.9 (7)	0.0 (3)
634	201 - 300	1618	1555	3.1 (16)	1.5 (4)
635	201 - 300	1274	1274	1.3 (3)	0.0 (4)
636	201 - 300	1455	1455	2.7 (3)	0.0 (3)
637	201 - 300	1132	1132	0.0 (3)	1.4 (14)
623	301 - 400	1027	494	1.3 (4)	0.0 (3)
625	301 - 400	850	888	6.7 (3)	8.7 (3)
626	301 - 400	919	1113	0.0 (3)	0.0 (3)
628	301 - 400	1085	1085	2.0 (3)	0.0 (6)
629	301 - 400	499	495	4.0 (3)	2.5 (4)
630	301 - 400	544	332	0.0 (3)	0.7 (3)
633	301 - 400	2179	2067	14.8 (18)	3.4 (5)
638	301 - 400	2059	2059	2.5 (20)	4.2 (21)
639	301 - 400	1463	1463	8.0 (15)	12.6 (8)
622	401 - 500	632	691	4.3 (4)	4.4 (5)
627	401 - 500	1184	1255	5.3 (3)	2.8 (8)
631	401 - 500	1202	1321	5.7 (3)	9.8 (4)
640	401 - 500	198	69	74.0 (3)	100.3 (3)
645	401 - 500	204	216	48.3 (3)	47.0 (3)
641	501 - 750	584	230	63.7 (3)	31.3 (3)
646	501 - 750	333	325	46.0 (3)	89.0 (3)
642	751 -1000	931	418	3.3 (3)	2.0 (3)
647	751 -1000	409	360	3.0 (3)	17.7 (3)
	Stratified Analysis:		Upper	6.8	6.6
			Mean	5.5	5.0
			Lower	4.2	3.5
	Converted Survey Abundance (millions)			11.8	10.8

3K Autumn 1993-1994 Mean Number per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

Table 7. Mean weight (kg)of redfish per standard tow in Division 3K from 1978-1992 Upper panel show results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets, 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	13.7 (5)	2.3 (3)	2.2 (3)	1.8 (10)	0.1 (9)	2.0 (10)	0.1 (13)	0.1 (14)	0.0 (9)	0.1 (14)	0.0 (12)	0.1 (15)	0.0 (8)	0.1 (14)	0.0 (3)
621	201-300	2859	0.8 (5)	0.7 (3)	2.9 (3)	0.6 (11)	0.2 (14)	0.0 (12)	0.1 (14)	0.1 (15)	0.0 (14)	0.0 (12)	0.0 (10)	0.0 (17)	NS	0.0 (5)	0.0 (3)
624	201-300	668	82.2 (4)	13.6 (2)	5.0 (2)	1.8 (2)	1.5 (4)	0.6 (4)	5.1 (4)	0.7 (4)	0.9 (2)	0.1 (3)	0.2 (3)	0.0 (3)	0.2 (4)	0.0 (2)	0.0 (3)
634	201-300	1618	84.9 (4)	7.3 (2)	33.5 (2)	7.1 (7)	42.5 (11)	2293.6 (5)	18.6 (7)	9.7 (9)	17.4 (5)	4.0 (11)	3.5 (6)	4.0 (7)	0.0 (2)	0.7 (25)	0.1 (25)
635	201-300	1274	88.2 (4)	159.4 (3)	12.5 (2)	1192.0 (5)	2.5 (5)	2.3 (6)	18.5 (8)	4.6 (7)	0.8 (6)	1.4 (6)	0.3 (5)	19.5 (7)	NS	0.0 (4)	0.1 (3)
636	201-300	1455	239.7 (4)	24.0 (2)	2362.4 (2)	11.0 (6)	19.1 (10)	72.5 (6)	4.9 (8)	3.9 (8)	3.4 (4)	1.4 (7)	1.7 (6)	0.7 (5)	NS	0.3 (3)	0.0 (3)
637	201-300	1132	99.0 (5)	232.4 (3)	29.5 (2)	336.4 (6)	18.2 (7)	139.2 (5)	5.0 (6)	25.9 (7)	3.3 (4)	0.8 (6)	2.4 (6)	0.9 (5)	0.5 (2)	0.4 (6)	0.0 (3)
623	301-400	1027	6.5 (3)	NS	32.3 (2)	2.5 (4)	2.8 (5)	84.2 (6)	5.4 (5)	2.7 (6)	0.6 (4)	0.2 (5)	0.8 (5)	0.4 (6)	0.2 (5)	0.5 (6)	0.6 (3)
625	301-400	850	35.9 (3)	16.3 (2)	54.3 (2)	303.5 (4)	4.0 (2)	219.0 (3)	8.3 (5)	23.1 (5)	0.2 (3)	11.3 (4)	0.3 (4)	1.1 (4)	0.1 (4)	0.3 (3)	0.0 (3)
626	301-400	919	51.9 (3)	13.2 (2)	27.5 (2)	77.3 (5)	19.4 (5)	2.8 (4)	2.6 (6)	14.7 (5)	0.4 (4)	2.6 (5)	0.1 (5)	196.4 (5)	NS	0.5 (3)	0.0 (3)
628	301-400	1085	47.2 (2)	57.5 (3)	9.8 (2)	16.8 (6)	3.1 (6)	11.4 (6)	7.7 (7)	1.3 (6)	0.0 (3)	0.5 (5)	0.3 (5)	0.2 (4)	NS	0.0 (3)	0.0 (3)
629	301-400	499	445.6 (3)	NS	65.0 (2)	28.3 (3)	12.5 (2)	974.0 (3)	7.7 (4)	7.4 (4)	3.6 (3)	9.4 (3)	4.5 (2)	1.3 (3)	NS	0.8 (4)	0.2 (3)
630	301-400	544	212.2 (2)	56.7 (2)	20.5 (2)	6.3 (2)	NS	36.8 (2)	114.0 (3)	14.9 (4)	13.9 (2)	1.3 (3)	0.0 (3)	0.5 (3)	NS	0.4 (3)	0.5 (3)
633	301-400	2179	1496.1 (4)	35.2 (4)	137.0 (3)	56.6 (8)	508.5 (7)	295.4 (12)	62.5 (10)	364.3 (12)	15.1 (8)	7.9 (11)	9.0 (8)	4.2 (10)	14.0 (11)	52.5 (25)	0.6 (25)
638	301-400	2059	115.9 (3)	102.6 (2)	260.1 (3)	44.3 (8)	33.1 (15)	65.6 (11)	72.9 (10)	47.0 (11)	7.4 (4)	58.7 (10)	553.3 (8)	15.4 (11)	0.9 (2)	1.9 (25)	0.2 (25)
639	301-400	1463	352.2 (4)	863.5 (2)	280.0 (2)	28.1 (6)	177.4 (10)	1903.7 (7)	329.9 (8)	232.8 (8)	786.5 (6)	75.6 (7)	57.7 (6)	11.9 (8)	302.4 (3)	4.7 (3)	0.3 (25)
622	401-500	632	7.3 (2)	3.3 (3)	5.8 (2)	16.3 (2)	14.2 (3)	14.0 (2)	5.5 (4)	1.0 (4)	1.8 (2)	0.4 (3)	0.1 (3)	1.0 (3)	0.7 (2)	0.4 (3)	0.4 (3)
627	401-500	1184	2.7 (2)	7.9 (3)	10.8 (2)	3.0 (6)	4.2 (7)	10.6 (6)	4.7 (8)	0.7 (7)	0.5 (5)	0.5 (6)	0.2 (5)	11.7 (6)	NS	0.0 (3)	0.3 (3)
631	401-500	1202	6.1 (2)	9.3 (3)	16.9 (3)	5.8 (5)	2.5 (2)	23.0 (5)	140.1 (5)	73.1 (7)	4.3 (4)	3.1 (6)	3.6 (6)	5.7 (7)	1.1 (2)	1.8 (6)	3.6 (3)
640	401-500	198	488.5 (2)	NS	476.3 (2)	181.5 (2)	191.5 (2)	NS	96.0 (2)	257.4 (3)	57.0 (2)	96.3 (2)	131.0 (2)	14.3 (2)	NS	8.3 (3)	1.3 (3)
645	401-500	204	748.6 (2)	NS	503.7 (2)	204.3 (2)	249.0 (3)	623.5 (2)	51.3 (2)	468.7 (3)	NS	210.8 (2)	210.5 (2)	620.0 (2)	57.6 (2)	14.4 (3)	3.9 (3)
641	501-750	584	370.6 (2)	84.6 (2)	228.0 (2)	98.0 (2)	88.4 (4)	34.5 (3)	54.0 (3)	47.6 (4)	NS	30.2 (3)	NS	NS	NS	11.9 (2)	1.3 (2)
646	501-750	333	1398.4 (2)	13.2 (2)	77.0 (2)	103.3 (2)	684.0 (2)	512.0 (2)	313.0 (2)	153.2 (3)	NS	255.5 (2)	NS	NS	6.0 (2)	44.6 (3)	12.7 (3)
642	751-1000	931	0.6 (2)	NS	3.0 (2)	0.7 (3)	1.7 (6)	NS	2.8 (6)	4.2 (5)	NS	1.0 (5)	NS	NS	NS	0.0 (2)	0.6 (2)
647	751-1000	409	16.6 (2)	0.3 (2)	12.4 (2)	2.5 (2)	0.3 (2)	NS	NS	145.3 (3)	NS	NS	NS	NS	6.9 (2)	11.6 (3)	0.3 (3)
Stratified Analysis:		Upper	441.9	622.0	1767.4	253.4	150.9	715.8	75.6	98.9	160.4	27.0	153.8	37.9	144.7	12.1	1.1
		Mean	203.3	83.2	191.4	98.1	72.0	328.8	46.1	61.3	49.5	16.2	51.7	16.5	30.0	5.8	0.5
		Lower	-35.3	-455.5	-1384.7	-57.2	-6.9	-58.1	16.7	23.6	-61.3	5.5	-50.4	-4.9	-84.8	-0.4	0.0
Total Survey Biomass ('000 tons)			488.6	171.1	462.4	208.4	148.3	663.6	88.8	128.4	98.8	33.7	106.8	31.8	37.1	11.2	0.8

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
620	201-300	2709	19.6 (5)	5.8 (3)	4.1 (3)	3.1 (10)	0.1 (9)	2.7 (10)	0.1 (13)	0.2 (14)	0.0 (9)	0.2 (14)	0.1 (12)	0.3 (15)	0.0 (8)	0.1 (14)	0.0 (3)
621	201-300	2859	2.9 (5)	1.3 (3)	3.9 (3)	0.7 (11)	0.5 (14)	0.1 (12)	0.2 (14)	0.3 (15)	0.1 (14)	0.1 (12)	0.0 (10)	0.0 (17)	0.1 NS	0.1 (5)	0.0 (3)
624	201-300	668	324.6 (4)	49.0 (2)	6.5 (2)	6.1 (2)	2.4 (4)	1.1 (4)	7.5 (4)	1.0 (4)	1.5 (2)	0.7 (3)	0.9 (3)	0.3 (3)	0.6 (4)	0.0 (2)	0.1 (3)
634	201-300	1618	153.8 (4)	11.5 (2)	59.7 (2)	14.8 (7)	60.0 (11)	4322.4 (5)	25.7 (7)	14.5 (9)	23.5 (5)	6.5 (11)	5.3 (6)	6.3 (7)	1.3 (2)	1.2 (25)	0.1 (25)
635	201-300	1274	244.6 (4)	165.7 (3)	24.2 (2)	1592.4 (5)	2.9 (5)	2.6 (6)	23.7 (8)	6.7 (7)	1.9 (6)	2.0 (6)	1.0 (5)	20.0 (7)	1.2 NS	0.1 (4)	0.3 (3)
636	201-300	1455	394.0 (4)	46.2 (2)	2327.3 (2)	18.3 (6)	20.1 (10)	77.2 (6)	7.2 (8)	4.9 (8)	6.1 (4)	2.4 (7)	3.0 (6)	1.2 (5)	0.3 NS	0.3 (3)	0.1 (3)
637	201-300	1132	219.3 (5)	360.7 (3)	67.3 (2)	399.4 (6)	23.5 (7)	174.4 (5)	6.1 (6)	35.2 (7)	4.8 (4)	1.7 (6)	3.6 (8)	1.6 (5)	0.4 (2)	0.5 (6)	0.0 (3)
623	301-400	1027	19.3 (3)	NS	42.3 (2)	3.7 (4)	3.5 (5)	74.6 (6)	7.4 (5)	3.2 (6)	1.2 (4)	0.6 (5)	2.0 (5)	1.1 (6)	0.3 (5)	0.9 (6)	1.6 (3)
625	301-400	850	57.0 (3)	23.5 (2)	54.7 (2)	283.3 (4)	6.1 (2)	227.7 (3)	11.6 (5)	36.3 (5)	0.4 (3)	15.5 (4)	0.8 (4)	3.0 (4)	0.3 (4)	0.5 (3)	0.0 (3)
626	301-400	919	67.7 (3)	17.2 (2)	26.7 (2)	86.1 (5)	41.8 (5)	3.9 (4)	3.5 (6)	19.0 (5)	1.0 (4)	5.0 (5)	0.2 (5)	224.7 (5)	0.0 NS	1.0 (3)	0.1 (3)
628	301-400	1085	49.2 (2)	46.6 (3)	7.9 (2)	18.6 (6)	3.7 (6)	11.0 (6)	6.8 (7)	1.6 (6)	0.0 (3)	0.9 (5)	0.7 (5)	0.4 (4)	0.0 NS	0.2 (3)	0.0 (3)
629	301-400	499	402.0 (3)	NS	59.8 (2)	29.2 (3)	16.4 (2)	1223.5 (3)	13.0 (4)	10.4 (4)	6.8 (3)	11.2 (3)	5.7 (2)	2.1 (3)	1518.5 NS	1.4 (4)	0.6 (3)
630	301-400	544	213.1 (2)	62.6 (2)	27.7 (2)	9.8 (2)	NS	80.2 (2)	131.7 (3)	15.9 (4)	21.8 (2)	1.4 (3)	0.2 (3)	0.8 (3)	0.7 NS	0.4 (3)	1.3 (3)
633	301-400	2179	3271.3 (4)	45.2 (4)	241.2 (3)	102.4 (8)	740.3 (7)	447.7 (12)	87.3 (10)	516.2 (12)	21.1 (8)	12.3 (11)	14.0 (8)	7.3 (10)	22.0 (11)	72.9 (25)	1.5 (25)
638	301-400	2059	271.7 (3)	112.1 (2)	447.4 (3)	62.9 (8)	44.7 (15)	83.4 (11)	94.0 (10)	61.7 (11)	9.6 (4)	62.4 (10)	568.2 (8)	19.1 (11)	133.5 (2)	3.4 (25)	0.4 (25)
639	301-400	1463	472.5 (4)	1170.5 (2)	267.3 (2)	44.0 (6)	283.9 (10)	3244.2 (7)	439.5 (8)	381.5 (8)	885.2 (6)	98.2 (7)	97.3 (6)	13.8 (8)	196.2 (3)	9.2 (3)	0.6 (25)
622	401-500	632	29.9 (2)	5.4 (3)	9.5 (2)	17.6 (2)	14.0 (3)	14.1 (2)	5.4 (4)	2.0 (4)	3.4 (2)	0.6 (3)	0.2 (3)	2.8 (3)	1.1 (2)	0.9 (3)	1.3 (3)
627	401-500	1184	2.9 (2)	12.7 (3)	21.7 (2)	4.0 (6)	7.9 (7)	13.5 (6)	6.6 (8)	1.9 (7)	1.1 (5)	1.0 (6)	0.5 (5)	17.5 (6)	5.6 NS	0.1 (3)	0.7 (3)
631	401-500	1202	6.8 (2)	15.0 (3)	26.4 (3)	9.4 (5)	4.7 (2)	29.2 (5)	223.8 (5)	98.0 (7)	7.1 (4)	4.4 (6)	6.3 (6)	9.0 (7)	1.3 (2)	4.2 (6)	9.1 (3)
640	401-500	198	643.4 (2)	NS	678.8 (2)	247.6 (2)	271.8 (2)	NS	151.7 (2)	334.8 (3)	94.1 (2)	141.1 (2)	196.1 (2)	24.1 (2)	49.0 NS	17.9 (3)	3.2 (3)
645	401-500	204	1075.3 (2)	NS	739.6 (2)	307.3 (2)	389.4 (3)	942.3 (2)	77.9 (2)	741.3 (3)	NS	258.4 (2)	319.6 (2)	985.4 (2)	101.3 (2)	28.4 (3)	6.8 (3)
641	501-750	584	463.6 (2)	95.3 (2)	273.0 (2)	124.7 (2)	115.2 (4)	37.9 (3)	65.9 (3)	67.1 (4)	NS	33.8 (3)	NS	NS	14.3 NS	18.2 (2)	2.9 (2)
646	501-750	333	1675.9 (2)	14.7 (2)	82.5 (2)	106.8 (2)	810.8 (2)	632.2 (2)	332.7 (2)	183.0 (3)	NS	248.2 (2)	NS	NS	8.0 (2)	78.8 (3)	24.9 (3)
642	751-1000	931	0.9 (2)	NS	3.2 (2)	0.8 (3)	2.3 (6)	NS	3.2 (6)	6.5 (5)	NS	1.1 (5)	NS	NS	1.5 NS	0.0 (2)	0.9 (2)
647	751-1000	409	18.0 (2)	0.3 (2)	18.8 (2)	3.8 (2)	0.2 (2)	NS	NS	150.0 (3)	NS	NS	NS	NS	7.1 (2)	15.1 (3)	0.5 (3)
Stratified Analysis		Upper	978.2	833.2	1805.1	333.7	216.2	1261.1	100.1	142.9	180.8	31.9	161.5	61.7	426.8	17.3	2.6
		Mean	383.8	110.2	220.2	127.6	103.2	552.2	61.8	87.9	57.3	19.4	57.5	22.0	51.0	8.7	1.2
		Lower	-210.6	-612.7	-1364.8	-78.4	-9.8	-156.7	23.5	33.0	-66.1	6.9	-46.6	-17.7	-324.7	0.1	-0.1
Converted Survey Biom('000 tons)			1022.4	416.3	949.6	491.6	396.2	2911.4	334.7	458.6	301.6	73.8	393.7	78.8	196.6	53.8	6.7

3K Autumn 1978-1992 Mean Weight (kg) per tow

Table 8. Mean weight (kg) of redfish per standard tow in Division 3K from 1993-1994. Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3.5 knots). Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3.0 knots) Number of successful sets in brackets. 'NS' = unsampled strata.

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi) 1978-1992	Area (sq n mi) 1993-Onwards	1993	1994
620	201 - 300	2709	2545	0.0 (3)	0.0 (5)
621	201 - 300	2859	2537	0.0 (3)	0.0 (3)
624	201 - 300	668	1105	0.1 (7)	0.0 (3)
634	201 - 300	1618	1555	0.2 (16)	0.3 (4)
635	201 - 300	1274	1274	0.2 (3)	0.0 (4)
636	201 - 300	1455	1455	0.1 (3)	0.0 (3)
637	201 - 300	1132	1132	0.0 (3)	0.0 (14)
623	301 - 400	1027	494	0.1 (4)	0.0 (3)
625	301 - 400	850	888	0.4 (3)	0.1 (3)
626	301 - 400	919	1113	0.0 (3)	0.0 (3)
628	301 - 400	1085	1085	0.1 (3)	0.0 (6)
629	301 - 400	499	495	0.0 (3)	0.3 (4)
630	301 - 400	544	332	0.0 (3)	0.1 (3)
633	301 - 400	2179	2067	0.6 (18)	0.4 (5)
638	301 - 400	2059	2059	0.3 (20)	0.1 (21)
639	301 - 400	1463	1463	0.4 (15)	0.6 (8)
622	401 - 500	632	691	0.3 (4)	0.2 (5)
627	401 - 500	1184	1255	0.1 (3)	0.2 (8)
631	401 - 500	1202	1321	0.1 (3)	0.3 (4)
640	401 - 500	198	69	4.1 (3)	3.7 (3)
645	401 - 500	204	216	4.1 (3)	4.3 (3)
641	501 - 750	584	230	6.5 (3)	4.9 (3)
646	501 - 750	333	325	5.8 (3)	10.2 (3)
642	751 -1000	931	418	0.8 (3)	0.1 (3)
647	751 -1000	409	360	0.5 (3)	4.9 (3)
	Stratified Analysis		Upper	0.5	0.7
			Mean	0.4	0.4
			Lower	0.3	0.2
	Total Survey Biomass ('000 tons)			**0.9**	**0.9**

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq n mi)	Area (sq n mi)	1993	1994
620	201 - 300	2709	2545	0.0 (3)	0.0 (5)
621	201 - 300	2859	2537	0.0 (3)	0.0 (3)
624	201 - 300	668	1105	0.3 (7)	0.0 (3)
634	201 - 300	1618	1555	0.5 (16)	0.3 (4)
635	201 - 300	1274	1274	0.3 (3)	0.0 (4)
636	201 - 300	1455	1455	0.2 (3)	0.0 (3)
637	201 - 300	1132	1132	0.0 (3)	0.0 (14)
623	301 - 400	1027	494	0.3 (4)	0.0 (3)
625	301 - 400	850	888	1.0 (3)	0.6 (3)
626	301 - 400	919	1113	0.0 (3)	0.0 (3)
628	301 - 400	1085	1085	0.2 (3)	0.0 (6)
629	301 - 400	499	495	0.2 (3)	0.6 (4)
630	301 - 400	544	332	0.0 (3)	0.1 (3)
633	301 - 400	2179	2067	1.4 (18)	0.8 (5)
638	301 - 400	2059	2059	0.4 (20)	0.2 (21)
639	301 - 400	1463	1463	0.9 (15)	1.3 (8)
622	401 - 500	632	691	0.7 (4)	0.5 (5)
627	401 - 500	1184	1255	0.4 (3)	0.4 (8)
631	401 - 500	1202	1321	0.5 (3)	0.9 (4)
640	401 - 500	198	69	8.7 (3)	10.1 (3)
645	401 - 500	204	216	8.2 (3)	7.0 (3)
641	501 - 750	584	230	12.5 (3)	7.9 (3)
646	501 - 750	333	325	11.2 (3)	20.1 (3)
642	751 -1000	931	418	1.5 (3)	0.3 (3)
647	751 -1000	409	360	1.0 (3)	6.7 (3)
	Stratified Analysis		Upper	1.0	1.2
			Mean	0.8	0.6
			Lower	0.5	0.4
	Converted Survey Biomass ('000 tons)			**3.2**	**3.2**

3K Autumn 1993-1994 Mean Weight per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

Table 8 Mean weight (kg) of redfish per standard tow in Division 3K from 1993-1994 Upper panel shows results of the Engels 145 otter trawl (MV Gadus Atlantica, 30 min tow @ 3 5 knots) Lower panel show Campelen trawl convertion based on comparative fishing trials (CCGS Teleost, 15 min tow @ 3 0 knots) Number of successful sets in brackets, 'NS' = unsampled strata

Original Survey Data (Engel 145)

Stratum	Depth range (m)	Area (sq n mi.) 1978-1992	Area (sq n mi.) 1993-Onwards	1993	1994
620	201 - 300	2709	2545	0 0 (3)	0 0 (5)
621	201 - 300	2859	2537	0.0 (3)	0 0 (3)
624	201 - 300	668	1105	0 1 (7)	0 0 (3)
634	201 - 300	1618	1555	0.2 (16)	0.3 (4)
635	201 - 300	1274	1274	0 2 (3)	0 0 (4)
636	201 - 300	1455	1455	0.1 (3)	0 0 (3)
637	201 - 300	1132	1132	0 0 (3)	0 0 (14)
623	301 - 400	1027	494	0 1 (4)	0 0 (3)
625	301 - 400	850	888	0.4 (3)	0 1 (3)
626	301 - 400	919	1113	0 0 (3)	0 0 (3)
628	301 - 400	1085	1085	0 1 (3)	0 0 (6)
629	301 - 400	499	495	0 0 (3)	0 3 (4)
630	301 - 400	544	332	0 0 (3)	0 1 (3)
633	301 - 400	2179	2067	0 6 (18)	0 4 (5)
638	301 - 400	2059	2059	0 3 (20)	0 1 (21)
639	301 - 400	1463	1463	0 4 (15)	0 6 (8)
622	401 - 500	632	691	0 3 (4)	0 2 (5)
627	401 - 500	1184	1255	0 1 (3)	0 2 (8)
631	401 - 500	1202	1321	0 1 (3)	0 3 (4)
640	401 - 500	198	69	4 1 (3)	3 7 (3)
645	401 - 500	204	216	4 1 (3)	4 3 (3)
641	501 - 750	584	230	6 5 (3)	4 9 (3)
646	501 - 750	333	325	5 8 (3)	10 2 (3)
642	751 -1000	931	418	0 8 (3)	0 1 (3)
647	751 -1000	409	360	0 5 (3)	4 9 (3)
	Stratified Analysis:		Upper	0 5	0 7
			Mean	0 4	0 4
			Lower	0 3	0 2
	Total Survey Biomass ('000 tons)			[illegible]	[illegible]

Converted Survey Data (Campelen Equivalents)

Stratum	Depth range (m)	Area (sq.n.mi.)	Area (sq.n.mi.)	1993	1994
620	201 - 300	2709	2545	0.0 (3)	0.0 (5)
621	201 - 300	2859	2537	0.0 (3)	0.0 (3)
624	201 - 300	668	1105	0.3 (7)	0.0 (3)
634	201 - 300	1618	1555	0.5 (16)	0.3 (4)
635	201 - 300	1274	1274	0.3 (3)	0.0 (4)
636	201 - 300	1455	1455	0.2 (3)	0.0 (3)
637	201 - 300	1132	1132	0.0 (3)	0.0 (14)
623	301 - 400	1027	494	0.3 (4)	0.0 (3)
625	301 - 400	850	888	1.0 (3)	0.6 (3)
626	301 - 400	919	1113	0.0 (3)	0.0 (3)
628	301 - 400	1085	1085	0.2 (3)	0.0 (6)
629	301 - 400	499	495	0.2 (3)	0.6 (4)
630	301 - 400	544	332	0.0 (3)	0.1 (3)
633	301 - 400	2179	2067	1.4 (18)	0.8 (5)
638	301 - 400	2059	2059	0.4 (20)	0.2 (21)
639	301 - 400	1463	1463	0.9 (15)	1.3 (8)
622	401 - 500	632	691	0.7 (4)	0.5 (5)
627	401 - 500	1184	1255	0.4 (3)	0.4 (8)
631	401 - 500	1202	1321	0.5 (3)	0.9 (4)
640	401 - 500	198	69	8.7 (3)	10.1 (3)
645	401 - 500	204	216	8.2 (3)	7.0 (3)
641	501 - 750	584	230	12.6 (3)	7.9 (3)
646	501 - 750	333	325	11.2 (3)	20.1 (3)
642	751 -1000	931	418	1.3 (3)	0.3 (3)
647	751 -1000	409	360	1.0 (3)	6.7 (3)
	Stratified Analysis:		Upper	1.0	1.2
			Mean	0.8	0.8
			Lower	0.6	0.4
	Converted Survey Biomass ('000 tons)			[illegible]	[illegible]

3K Autumn 1993-1994 Mean Weight per tow

Note: Survey area was restratified based on revised hydrography charts and implemented on the 1993 survey For further information see Bishop (1994), Murphy (1996))

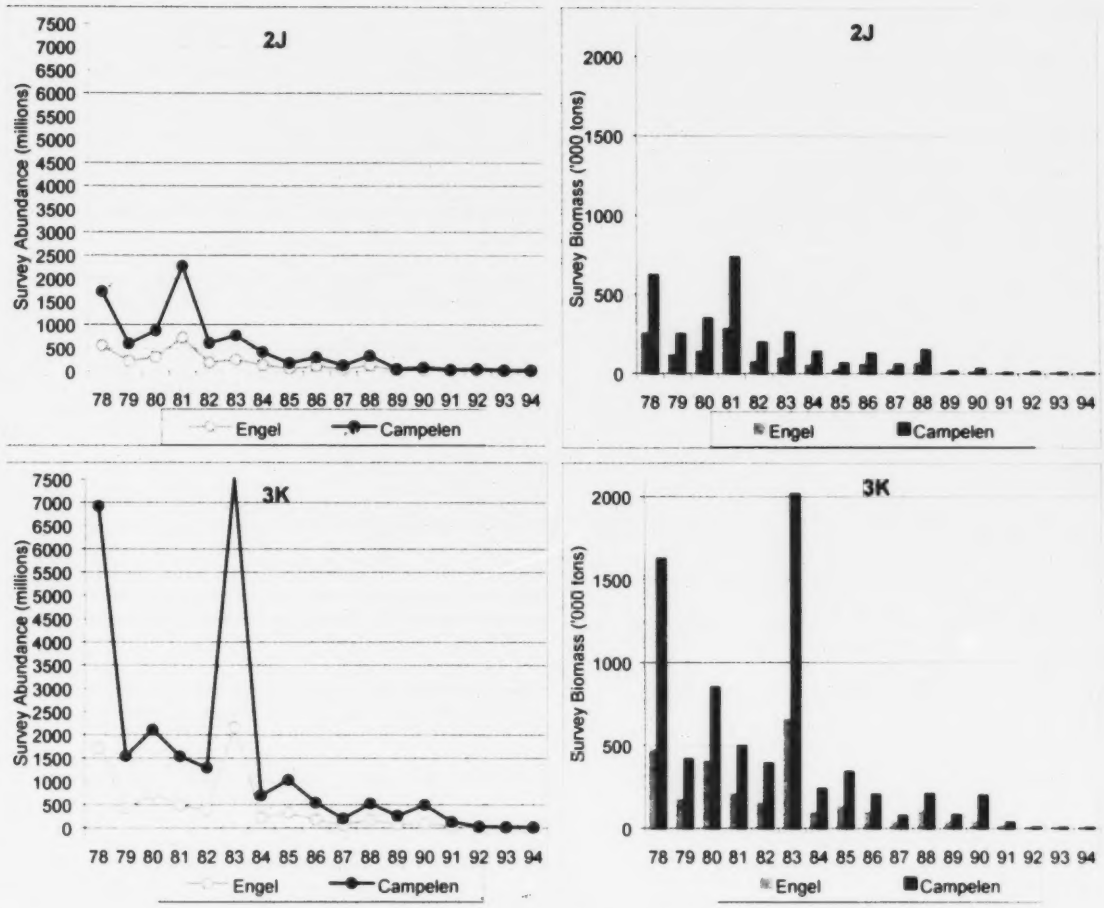

Fig 1. Comparison of survey indices of relative abundance for redfish between the Engels trawl data and values derived as Campelen equivalents based on comparative fishing trials between the MV Gadus Atlantica (Engel trawl, 30 min tows @3.5 knots) and CCGS Teleost (Campelen trawl, 15 min tows @3.0 knots)

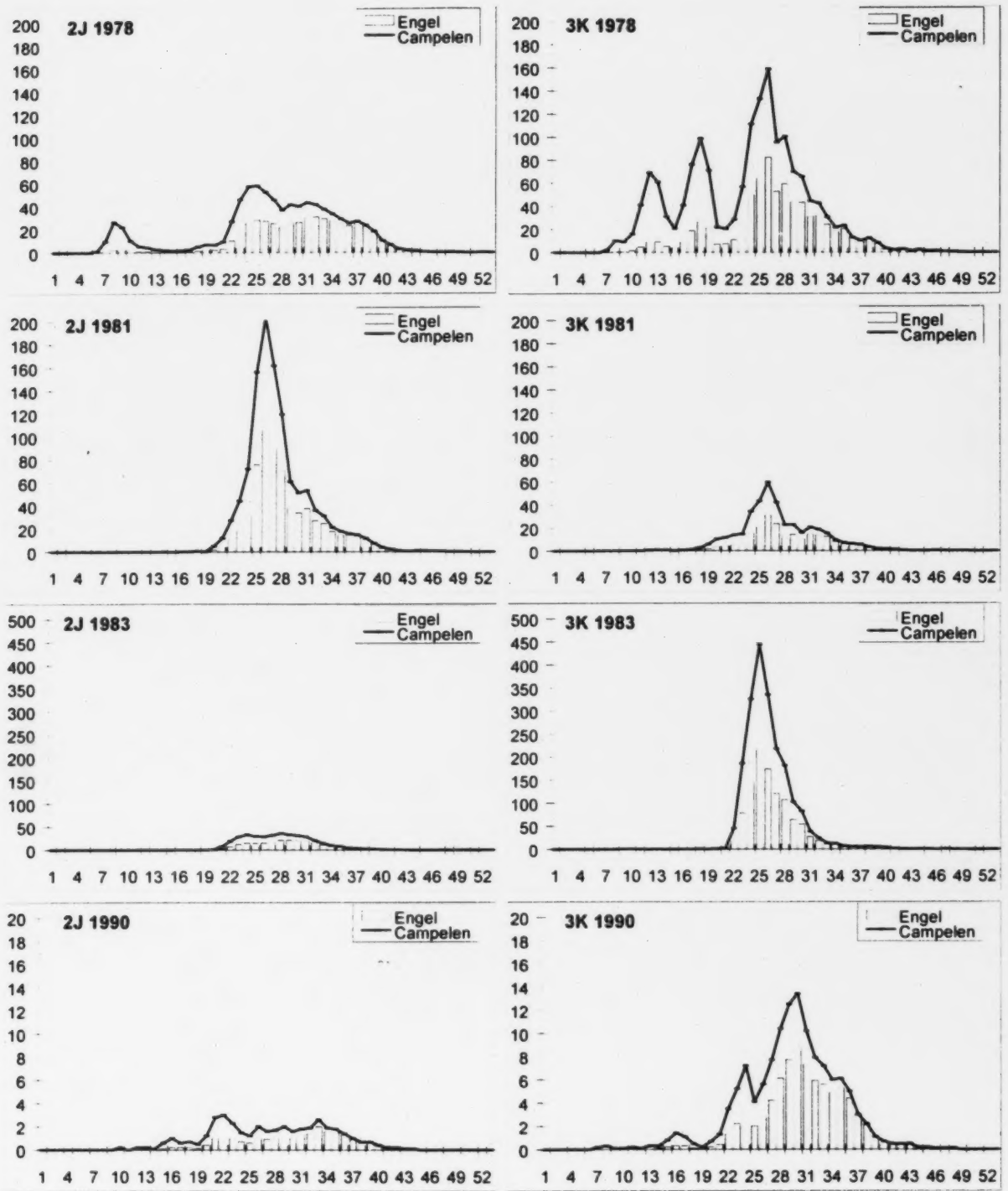

Fig. 2. Length distributions from stratified-random research surveys to Div. 2J (left panels) and Div. 3K (right panels) during various years. Plotted are mean number per standard tow. The bar frequency represents the Engels data and the line represents a conversion into Campelen equivalent units based on a comparative fishing trial (see text)